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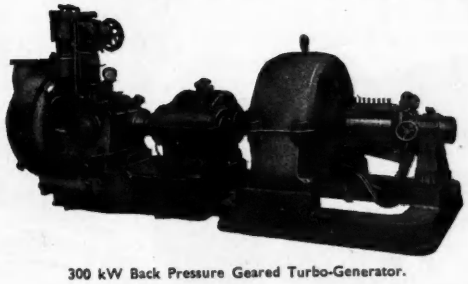

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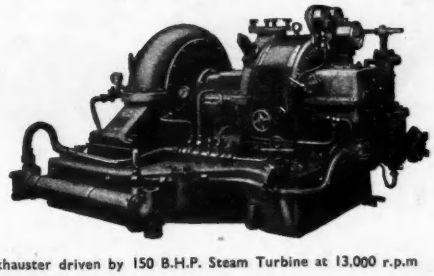

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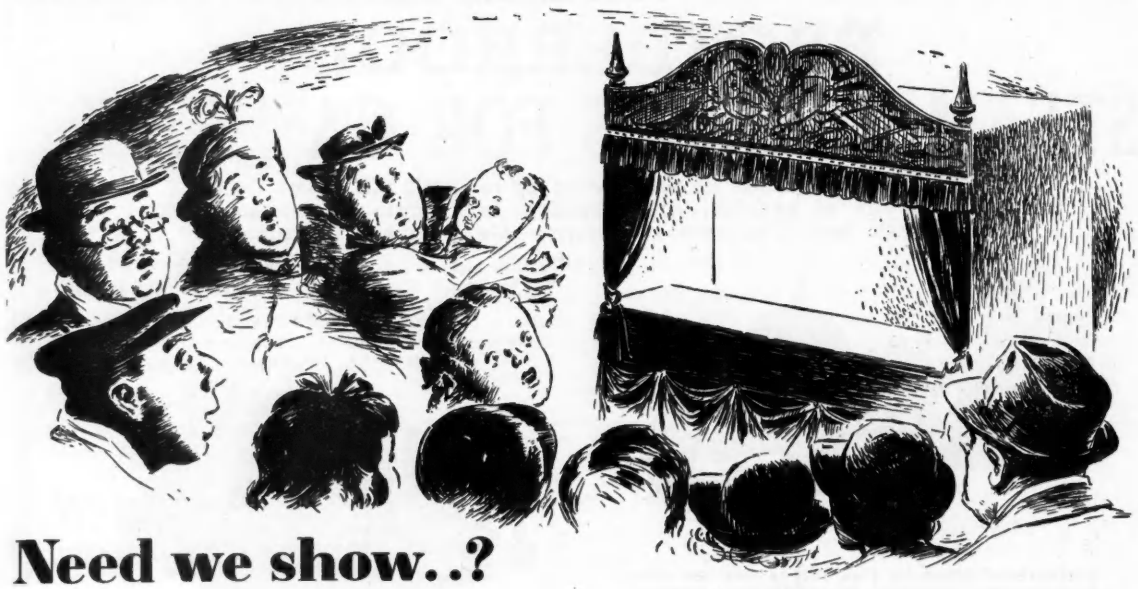

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GAS JOURNAL, JUNE 21, 1944

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EDITORIAL NOTES

ON THE QUESTION OF NEEDS

"FUTURE prospects for gas engineers are better than they were thirty years ago." This is taken from the I.G.E. "short" by Mr. Pearson. We think he is right—if we take hold of the wheel knowing our road and depress our foot with rather less caution on the accelerator. Knowing the Gas Industry and its composite make-up, we are sure that such a suggestion implies no major risk. For the Industry is sound enough, has great experience, has untold potentialities, and—what is important and encouraging—is beginning to admit some of the weaknesses which it may have realized, but (the essence of gas supply being continuity) has not thought it necessary to peer into too closely or placard too obtrusively. Achievement of continuity of gas supply over decade after decade, interspersed with sundry wars, each one rendering gasmaking plant, distribution system, and "internal installation"—*i.e.*, the consumer's home—more vulnerable, does demand an element of care. During the present war, in which science is playing no minor role, the demand for gas has very largely increased; gas has shared in the fashioning of innumerable beautiful bombs, the while helping simultaneously the bombed-out and the munition worker in his or her factory or home. Behind this continuity of supply—vital in common with other public services afforded without fuss—has been the gas engineer. And when we are asked what qualifications a gas engineer should have to make the Gas Industry successful in the broadest sense, we say that some at least of the needed qualities cannot be gauged by a board of examiners on subjects such as the stress of materials or thermodynamics, or accountancy and business management, or industrial psychology. During the past five years the Gas Industry has scaled considerable heights, thanks, at any rate to some extent, to certain qualifications of the Gas engineer, who, we suggest, has "bossed" for the most part in an understanding way and has inspired confidence.

We would like to say a few words more about the "understanding boss," a keypin in any public utility, for his responsibility is not light. It seems to us germane to the I.G.E. "shorts" we publish to-day, which blend and contrast the views of boss and "bossee" and add the flavouring of the specialized technician—all viewpoints, dispersed at source, concentrating on a single pivot. Mr. Pearson says that in the future there will be much more specialization in the Gas Industry, and that the demand will be for a series, as it were, of specialized bosses. The functions of management, for instance, will be separated from the functions of the engineer. He remarks bluntly, "The future gas engineer will emerge as a specialist." Dr. King, as Director of the Gas Research Board, explains in most helpful and practical manner how such a research organization could be run to give best results—how preferably it could be administrated and manned, and equipped. In no derogatory sense do we describe the "short" of Messrs. Platt and Bujnowski as giving the angle of the "bossee"; it is essential to the balance of the picture. Nor would the canvas be complete without the stipple of the barrister-at-law, and no doubt we need the flourish of the display-man. Presumably, following the Committee of Enquiry appointed by the Ministry of Fuel and Power, the Government will approve of and hang the picture—we use the word "hang" strictly in its academic sense. We envisage, then, a series of understanding chiefs supported by enthusiastic under-chiefs, qualified for their respective niches. Towards this end, which would appear inevitable and not unpalatable, the examination sieve will do something, no doubt, but obviously it will not by a long chalk fill the bill. Perhaps in the future there will be a seven-year big-chief university course leading to the degree of M.U. (Master of Understanding), a distinction to be gained by quiz methods beyond our ken to-day.

THE PUSH AND THE PULL

WE suggest that, taken together, for they are indeed complementary, the Papers by Mr. Pearson and Messrs. Platt and Bujnowski make a short-chassis I.G.E. jeep—a jeep the reverse of pilotless and calling foremost for the human element. And everyone knows how useful a well-piloted jeep is in covering difficult ground.

Mr. Pearson gives driving force, pulling force, from the Senior universal; Messrs. Platt and Bujnowski (both Seniors, by the way) give driving force, pushing force, from the Junior universal. Their jeep steers towards unsympathetic terrain, towards the rocks of salary and shallows of status. The Gas Industry will not develop as a robot, however scientifically cunning that robot. Its success will depend on the realization of higher efficiencies—all-round efficiencies—wider appreciation of potentialities which with a little thought are apparent enough, and on constant enthusiasm to afford the public the best possible fuel service as an essentially human industry. Senior and junior must work hand in hand in common purpose under the banner of enlightened leadership. Recruitment of able young men with a pride in their job is a *sine qua non* to the fulfilment of Gas Industry hopes, and enthusiasm must be encouraged and kept burning by hard cash as well as by soft phrases. It will be wholly insufficient to work on the basis that the Industry is to an extent a sheltered industry, and to tell the aspirant to position and honours that he is a lucky man to be allowed to enter the Industry on a wage and salary basis affording a minimum ration of bread and butter, but never a *soupçon* of jam—a diet meagre in comparison with that offered by other industries; a concentration-camp menu killing incentive and lowering status. Of course, a man must be prepared to do a fair day's work for a fair wage, irrespective of the weather of any particular day, but a man should not be expected to be enthusiastic and to give of his best at a remuneration which, if keeping starvation at bay, has no prestige value at all. Obviously we need a reliable machine working harmoniously and at high momentum with pull and push, intelligently lubricated on an adequate, comparative, and attractive wage and salary scale.

In Mr. Pearson's opinion no gas-works after the war will be free to carbonize coal without conforming to the direction of a higher technical control. Over hundreds of undertakings, he is convinced from wartime experience, at a very conservative estimate 10% of the coal used in the gasmaking process could be saved. During the last 30 years the net cost of coal to gas undertakings has increased by 500% and more. It is economically imperative to view qualifications and salaries in a more generous light. And it should be appreciated that the young and promising entrant to any profession is concerned not only with his ultimate prospects, but vitally with his immediate remuneration. For self-respect and the enjoyment of some draught of the wine of a full life, a man in the early thirties needs

more cash than the Gas Industry thinks fit to pay him for his services, and in this respect the Industry has reaped its just reward of a cheese-paring policy which can only be the outcome of a belief that by and large what it has to offer its consumers is not worth very much. No highfalutin talk about gas engineers needing to have the qualifications of scientific demi-gods can, if we have an eye on the salary list, be taken at all seriously. It is really quite surprising that the quality of the junior personnel of the Industry is of as high a standard as it is under the Gas Industry's tight, parsimonious hold on the purse-strings. We have sufficient faith in the potentialities of the Industry to feel sure that the money-bags would in fact be far heavier and of better coin if the string-stranglehold were loosened. Let us hope that the suggestions put forward from different angles by Mr. Pearson and by Messrs. Platt and Bujnowski—suggestions which boil down to wiser and larger expenditure for good and better staff work and in the recruitment of brighter and keener young men—will have some effect in loosening the grasp on the salary money-bags and widening the outlook on the matter generally.

The imaginary machine we have pictured, well and co-operatively piloted, following a marked course for the benefit of the community—a machine the torque of whose engines is nicely balanced; a machine maintained in tip-top condition and constantly embodying new improvements, and, as we have said, having due attention to the vital need of adequate lubrication—needs for its best performance first-grade fuel. And we will complete the metaphor by suggesting that the Paper by Dr. King indicates some of the steps we can take to upgrade the source of the machine's motive power.

Test by Result

The account of the Chairman at the annual meeting of the United Kingdom Gas Corporation (see page 803 of this issue) makes very good reading. He described as the outstanding feature of the Corporation's activities during the past year the extension of group working whereby subsidiary undertakings conveniently situated geographically, and of a size convenient for unified operation and administration, are placed under combined management. In the "JOURNAL" last August we referred to the progress of the Corporation's first group, formed about six years ago—the Castleford group. Originally comprising eight undertakings, this has now been extended to include a further seven companies, all under combined central management. The whole is now known as the West Riding group. The Chairman Mr. Bruce Ottley, gave an indication of the results achieved by the original group. It has been possible to standardize the price of gas throughout the area, the net result being that the average price received for all gas sold as the outcome of centralized control and administration is 25% below the average price received at the time the group was formed. Accompanying this has been better service to the consumer, made possible by specialized staff reinforced by that of the Corporation.

Personal

Mr. G. D. HUTCHINS, C.B.E., has retired from the Secretaryship of the Woodall-Duckham Vertical Retort & Oven Construction Company (1920), Ltd., and of Woodall-Duckham (1920), Ltd. He has been appointed a Director of Woodall-Duckham (1920), Ltd., and will continue in the service of the Woodall-Duckham Vertical Retort Company in a consultative capacity. Mr. N. G. LANG, who has held the office of Assistant Secretary for the past 20 years, has been appointed Secretary of these Companies as from July 1.

* * *

Mr. J. M. MCLUSKY, Engineer and Manager to the Calverley and Horsforth District Gas Company, has been appointed a Director of the Company.

* * *

The Minister of Fuel and Power has appointed Mr. HAROLD HOBSON, B.Sc., M.Inst.C.E., M.I.E.E., the present General Manager of the Central Electricity Board, to be Chairman of the Board in the place of Sir Archibald Page, M.Inst.C.E., M.I.E.E., who has resigned for health reasons as from July 31.

The Central Electricity Board announce that consequent upon the appointment of Mr. Hobson as Chairman, they have appointed Sir JOHNSTONE WRIGHT, Chief Engineer, to succeed him as General Manager. Mr. J. HACKING, Deputy Chief Engineer, has been promoted to be Chief Engineer.

Letters to the Editor

Crude Ammoniacal Liquor for Agricultural Use.

DEAR SIR,—I have been interested in an account recently in a newspaper describing the successful use of sulphuric acid as a spray to kill unwanted weeds and insects.

Past columns of the "JOURNAL" have instanced the use of gas-works crude ammoniacal liquor for this same purpose, and one wonders why such use has not developed, to the national economy.

I recall a keen amateur gardener, some 40 years ago, who purposely produced in porous soil, for the local flower-show, by the daily dose of a weak solution of sulphate of ammonia in water 32 potatoes each over 2 lb. in weight and celery sticks 5 ft. long. Also his garden generally, and his strawberry beds in particular, were always excellent. He doused his strawberries with crude ammoniacal liquor in the autumn, thus destroying all signs of life of plants, weeds, and insects, yet in the spring the manurial value of the contained ammonia brought forth strawberries in highly desirable condition, both qualitatively and quantitatively.

Seeing that crude gas-works liquor is so cheap and plentiful and that it contains the three highly desirable factors of weedkiller, insecticide, and *delayed-action* fertilizer, all in one, I ask whether there has been any wartime experience of its use.

"*Stoke-Pero*," Yours faithfully,
43, Uxbridge Road, H. J. TOOGOOD.
Hampton-on-Thames, Middx.
June 13, 1944.

Pensions Schemes and Post-War Planning

DEAR SIR,—The Gas Industry can rightly claim a high place among employers who regard the welfare of their staffs as of first-class importance. It is a well-known fact that such things as Pensions, Co-Partnership benefits, and general security of employment are regarded as characteristic of the Gas Industry. It is surely a tribute to the Industry that those within it can take such things for granted, and that they are the rule rather than the exception.

In not every respect, however, is this general state of security beneficial either to the individual or to the Industry. One has not to look very far to see cases of men who are obviously in the wrong team, men who would be happier elsewhere but who dare not make a change because of the inevitable loss of pension rights and in some instances of Co-Partnership benefits too.

When a man has been with a Company more than five years he may find that his chances of promotion are remote because of the limited number of posts available. If he is still under, say, 25 years of age he may think of a pension as something so far off that it has not even entered into his scheme of things, and he may therefore ignore the fact that by leaving his present job he may lose the benefit of pensionable years of service. In due course, however, it will become increasingly evident to him that the more often he changes his employer the more reliance he must place on his own capacity to save, and the smaller his opportunity to qualify for a pension owing to the way in which many pensions schemes provide merely for the withdrawal of his own contributions when he vacates his membership before becoming 65 years of age.

I have personal knowledge of comparatively young men who have already been in two pensions schemes, and whose first 10 years of service to the Industry carry no pension rights on account of their having vacated their jobs and having had their contributions refunded on each occasion. They are now sitting up and taking notice, and the danger is that what may be called the "ball and chain" aspect of the situation may prevent them from taking other plunges which would be beneficial to themselves and their employers.

There are, of course, numerous schemes which use the facilities which insurance companies offer for providing pensions, and in these cases it sometimes happens that when an employee leaves to go elsewhere he has several options open to him, such as:

1. To take a paid-up policy for a small pension payable at the normal retiring date, the pension being based on his own and the undertaking's contributions to the date of leaving.
2. To continue to pay his contributions direct to the insurance company so as to preserve his pension rights, although these would obviously be reduced in amount owing to there being no continuing contribution by the undertaking.
3. To withdraw his own contributions.

Such schemes are really admirable although in certain instances the cost is rather high.

Despite all the good work which has been and is being done in this field, however, I believe it is a fact that a large number of gas under-

takings still have their own self-administered schemes, and that generally speaking these schemes provide pensions only for those who "stay the course," and that anyone who "falls out" by leaving the company's service before he is 65 years old has no right other than to the return of his contributions.

In all post-war plans there should be as great a degree of flexibility as possible. One of the factors which has imposed a certain rigidity on the personnel side of the Industry is the knowledge that moving means personal loss to the individual. I therefore suggest that those in control would be performing a very useful service both to the Industry and to its servants if they were to take stock of the situation as far as it concerns their own company, and that they should make arrangements which would ensure that whatever pension benefits have been acquired by those wishing to move are secured to them. I feel sure that this extension of security would react to the lasting benefit of the Industry, and would make all the difference in the world to many forward-looking individuals upon whom the future success of the Industry will depend.

Yours faithfully,

June 12, 1944. NORMAN H. DAVIES.

Institution of Gas Engineers

The following telegraphic message has been received by the Council of the Institution from the retiring President (Mr. James Jamieson):

> To-day, June 12, members and friend of the Institution should have been assembling for our Annual Meeting in Edinburgh. Unfortunately circumstances over which we have no control have intervened and have made that impossible. I wish to express on behalf of my Lord Provost, my Convener, and Members of my Committee how much we regret that you are not with us, an expression in which I whole-heartedly join. Let us hope that when happier times arrive you will be able to visit our ancient capital City and enjoy the hospitality which I feel certain you would have enjoyed had it been possible for you to visit us at this time.

To this message the incoming President (Mr. S. E. Whitehead) has sent the following reply:

Dear Mr. Jamieson,—

Your last official act as President was to send us your welcome telegram of the 12th instant, and my first duty as your successor is to acknowledge it.

At yesterday's meeting of the Council it was unanimously desired that I should write to you thanking you for your message, and also expressing the Council's appreciation of all you have done for the Institution in the past, particularly during your Presidency.

We realize that you have had an unfortunate year of office, particularly with regard to war conditions and the difficulties of travel, and we know how keenly disappointed you must be at the unavoidable cancellation of the Annual Meeting. It was equally a disappointment to the Council and members of the Institution, who had all anticipated a most enjoyable visit to Edinburgh.

The Council will be grateful if you will kindly convey to the Lord Provost their deep appreciation of his interest and of the welcome and hospitality which he so freely offered to the Institution, together with their sincere regrets at their inability to enjoy them. They would also send their sincere thanks to your Convener and Members of your Committee for their kindness in the same direction.

Expressing, on behalf of the Council and myself, every good wish for the future,

Yours sincerely,

June 17, 1944. S. E. WHITEHEAD.

Membership of the I.G.E.

The following have been elected to the various classes of membership of The Institution of Gas Engineers.

Honorary Membership (4).—The Presidents (*ex officio*) of the Gas Associations of Australia, Canada, New Zealand, and United States of America.

Membership (8).—Dent, F. J., D.Sc., Ph.D. (Assistant Director, Gas Research Board); Gooderham, W. J., B.Sc., A.R.C.S. (Research Chemist, Gas Light and Coke Company); Harrison, G. H. (Manager, Derwenthaugh Coke-Works, Consett Iron Company, Ltd.); King, J. G., O.B.E., D.Sc., Ph.D., A.R.T.C., F.R.I.C. (Director, Gas Research Board); McGown, S. (Assistant Manager, Provan-Works, Glasgow Gas Department); Neil, G. (Engineer, Southampton Gaslight and Coke Company); Potter, R. B., B.A., M.I.Mech.E. (Chairman, Simon-Carves Ltd.); White, J. E. (Chief of Gas Sales, Newcastle-upon-Tyne and Gateshead Gas Company).

§§

Associate Membership (26).—Armitage, S. (Technical Assistant to Distribution Engineer, Bristol Gas Company); Barker, F. C. (Shift Engineer, Coventry Gas Department); Buxton, O. (Joint Central Heating Engineer, South Metropolitan Gas Company); Carson, B. H. K., B.Sc. (Manager, Technical Department, Ascot Gas Water Heaters, Ltd.); Christie, J. T. (Technical Assistant, Greenock Gas Department); Collis, E. G. (Area Representative, Gas Light and Coke Company); Dann, A. F. (Distribution Superintendent, Skegness Gas Department); Denoon, J. R. (Technical Assistant, Edinburgh Gas Department); Gibson, J. M. (Technical Assistant, Liverpool Gas Company); Hart, H. B. J. (Deputy Engineer and Manager, Shipley Gas Department); Heywood, S. (Industrial Gas Engineer, Liverpool Gas Company); Holmes, G. G. (Assistant Works Engineer, Hastings and St. Leonards Gas Company); Hoskin, W. A. P. (Assistant Works Manager, Barnsley District Coking Company, Ltd.); Hunt, J. R. (Industrial Gas Engineer, Stourbridge Gas Department); Messenger, E. I. (Junior Technical Assistant, Workington Gas Department); Munro, G. (Senior Chemist, Provan-Works, Glasgow Gas Department); Richardson, C. W. M. (Works Chemist, Dartford Works, South Suburban Gas Company); Roberts, P. (Chemical Engineer, West's Gas Improvement Company, Ltd.); Robson, F. L. (Technical Assistant, Bradford Road Works, Manchester Gas Department); Stacey, J. W. (Assistant Superintendent, Neepsend Works, Sheffield and District Gas Company); Taylor, M. H. (Technical Assistant, Clitheroe Gas Department); Timmins, F. A., B.Sc. (Assistant Engineer, Gas Light and Coke Company); Twist, R. F., M.Sc. (Research Chemist, South Metropolitan Gas Company); Wearne, E. (Assistant Works Manager, Newcastle-upon-Tyne and Gateshead Gas Company); Wright, L. S. (Works Chemist, Stoke-on-Trent Gas Department); Young, C. A. (Chief Technical Assistant, Shrewsbury Gas Light and Coke Company).

Associateship (1).—Haley, T. M. (Local Manager, South African Lighting Association).

Institute of Fuel

To encourage the preparation of papers by students of fuel technology, the Council of the Institute of Fuel have decided to make an annual award of a Medal, together with a prize consisting of books and/or instruments to the value of £5. The paper has to be submitted by a Student Member of the Institute or by a student under 25 years of age of any University or Technical College in the United Kingdom.

The paper shall deal with some subject relating to the preparation or utilization of fuel, or allied subjects. While the student is left free to choose his own subject if he so desires, the following subjects are suggested as a guide to his choice:

(*a*) Discuss the industrial use of any two of the following gases: Town gas, coke oven gas, producer gas, blast furnace gas, water gas, natural gas.

(*b*) The trend of development in high or low temperature carbonization of coal.

(*c*) What is our present knowledge about the specific heat and heat conductivity of coal and coke?

(*d*) The principles of screening.

(*e*) Discuss the factors influencing the efficient blending of solid fuels.

(*f*) The fundamental principles influencing the segregation of coal in bunkers when filling or discharging.

(*g*) The possible developments in the use of petroleum gases.

Papers must be submitted to the Secretary of the Institute under a *nom de plume*, the name and address of the author being enclosed in a sealed envelope and sent with the paper. Papers must be received by the Secretary on or before Sept. 1 in any year.

Papers must be limited to a maximum of 6,000 words, and may be illustrated by line drawings or photographs.

Diary

June 22.—Association of Gas Corporations: Council, Gas Industry House, 2.30 p.m.

June 22.—B.C.G.A. Domestic Heat Services Committee: Gas Industry House, 2.30 p.m.

July 6.—Industrial Gas Centres Committee: Gas Industry House, 10 a.m.

July 11.—National Federation of Gas Coke Associations: General Committee, Gas Industry House, 10 a.m.

There will be no meeting of the N.G.C. Central Executive Board in June.

The fact that goods made of raw materials in short supply owing to war conditions are advertised in the "Journal" should not be taken as an indication that they are necessarily available for export.

Institution Presidential Address

By Mr. JAMES JAMIESON

MY first duty and pleasure in opening this Address to my colleagues in the Gas Industry is to express my own personal pride and gratification that I should be thought worthy to occupy this honoured position, and to acknowledge the compliment which has been paid to Scottish gas engineers in that one of their number should have been chosen as President. Regarded as a compliment to the Gas Industry of Scotland, we Scotsmen feel that it is not unmerited because the Gas Industry of the world does rest under some obligation to the ingenuity, wisdom and enterprise of these Scottish engineers who have contributed to the development of the technique of coal carbonization. There come to mind such names as William Murdoch, William Young, Sir George Beilby and others. It is a long time since the engineer of a Scottish Gas Undertaking held this office. The last occasion was in 1911, when Alexander Wilson of Glasgow had that honour, but there have been a number of Scotsmen who, having migrated to England, later filled the President's chair with distinction.

With so many shining examples before me, it is a cause of very deep regret to me that I have been unable during my year of office to attend to my duties as I should have wished. In these strenuous times it has not only been difficult for me to leave my responsibilities here and to travel the long distances involved, but unfortunately in this particular year my health has made it impossible for me to emulate the outstanding services that were rendered to the Industry by my predecessor through his attendance at meetings of the Affiliated District Gas Associations. In this regard, I am under a deep sense of obligation to the Vice-Presidents, Mr. S. E. Whitehead and Col. C. M. Croft, for the extent to which they have deputized for me on many occasions.

Development in the Gas Industry

The past year has probably been one of the most important in the history of the Gas Industry. It was the year in which, after much labour, the British Gas Federation issued its Planning Report to the Ministry of Fuel and Power. It was the year, too, in which the Advisory Committee of the Gas Industry really got to work with the Director of the Gas and Electricity Division of the Ministry. It was also the first complete year covering the working of the Regional Gas Engineering Advisory Boards, the Co-ordinating Committee of which is convened by the Institution. All these developments are of supreme importance to our Industry, but there are many activities in which the Institution, through its members, is taking part, but about which very little is heard except where important developments in policy are initiated and the beginnings of evolutionary changes can be found. As one instance one might mention the useful collaborative work between the fuel interests that is taking place as a result of the deliberations of the Heating and Ventilating Committee of the Ministry of Works and Planning. Another instance is the contribution that is being made towards the co-ordination of technical fuel matters by the Institute of Fuel, on the Council of which the Institution is represented.

While the Institution, as such, has no direct responsibility for the questions that have arisen during the last two years in connexion with the decisions that are called for relating to the future integration of the Industry, it is evident that it has in the past done much that should assist in achieving that end. I have had prepared in the form of Appendices 1 and 2 memoranda relating to the evolution of the Gas Industry and the bodies concerned with its control. Most of these bodies were brought into being through the direct initiative of The Institution of Gas Engineers. To-day the Institution can be looked upon as a professional body of high repute which has as its prime responsibilities the technical education of the gas engineer and, in an advisory capacity, the technical development of the Gas Industry. I sincerely believe that there is no industry in this country which is so highly and so well organized on the technical side in its central body as the Gas Industry, although it may still fall short of the ideals at which we aim. I wish the same could be said of the administrative side of our Industry. To-day technical development is far in advance of administration; engineers and chemists can get very little further in any radical way unless the administrators bring about some form of national or regional overriding directive authority which can implement the recommendations of the technicians. On these and other grounds the proposal that the Ministry of Fuel and Power should initiate a comprehensive independent enquiry as to the future of our Industry is worthy of our strongest support.

Committees of Enquiry

Pending such an enquiry there is much that can usefully be done by our members, and I am glad of this opportunity of drawing attention to the purpose and findings of the four Committees of Enquiry set up by the Council in 1941. I regard it as a matter of considerable significance that the Institution, as the recognized technical body of the Industry, took the initiative in this matter. It will be remembered that in 1941 the Annual General Meeting took the form of a symposium on "The Gas Industry: 1941 and After," and the four Committees of Enquiry resulted from the subsequent discussion.

The terms of reference of these Committees were as follows:

(a) *Gas Quality*.—To enquire into and make recommendations on the most suitable quality of gas, from all aspects, for supply to consumers in Great Britain.

(b) *Sulphur Removal*.—To enquire into and make recommendations on the removal of sulphur from town gas.

(c) *Standardization of Appliances*.—To enquire into and make recommendations on the standardization of domestic consumers' appliances.

(d) *Coke Quality*.—To enquire into and make recommendations on coke grading and on the properties of coke in relation to its domestic and industrial utilization.

The four Committees not only considered the material contained in the Papers and discussions thereon at the 78th Annual General Meeting, but also invited, through the technical press, interested parties to submit evidence and expressions of opinion. During the autumn of 1941 and the spring of 1942 these four Committees were active, considering their respective terms of reference, taking evidence from witnesses, and summarizing their views. Some time after the setting up of the Committees of Enquiry, the Central Planning Committee of the British Gas Federation, with its various sub-committees, came into being. The Institution of Gas Engineers was well represented on this Central Planning Committee, and it was therefore decided by the Council of the Institution that the correct procedure was for it to pass forward the Reports of its Committees of Enquiry to the Central Planning Committee as and when they were completed.

During the Summer of 1942 the reports were received and approved by the Council of the Institution, and were issued to the members of the Institution and for publication in the technical press. The Committees of Enquiry on Gas Quality and on Sulphur Removal covered their terms of reference. The Committee on Standardization of Appliances issued its report as Part I—Domestic Gas Cookers; the Committee on Coke Quality issued its report as Part I—Sizing of Coke. More recently the Coke Quality Committee issued a second report, Part II, on the Properties of Coke.

At the time of the last Annual General Meeting of the Institution, in June, 1943, the Report of the Central Planning Committee of the British Gas Federation had not been issued, and consequently no particular comment was made concerning these four Reports.

I should not like this opportunity to pass without emphasizing that the formation of technical Committees of Enquiry and the issue of Reports is one of the most useful functions which can be undertaken by our Institution. The organization of the Industry may well be left in the hands of some national body, such as the British Gas Association; the carrying out of research is well placed in the hands of the Gas Research Board, but there will always be matters of prime importance on which the technical views of the Gas Industry can best be obtained through the Institution.

Owing to the wide terms of reference given to the Central Planning Committee, its report mainly relates to the organization of the Industry and, as a consequence of this, it makes no reference to the findings of the Committees of Enquiry. I feel, therefore, that it may not be out of place to look at the decisions of these four Committees with a view to seeing what steps can be taken by the Industry towards the adoption of their findings. It is of importance to note that all four Reports advocated an evolutionary procedure, and that if gas engineers are convinced that the findings of these Committees are sound, much can be done in the direction of putting them into effect without waiting for any reorganization or re-planning of the Industry. Such steps would all be in the direction of our main purpose of giving the consumer a better service. May I, then, very briefly mention some of the conclusions and recommendations of these Committees.

Gas Quality.

The Committee of Enquiry on Gas Quality recommends that the present freedom of choice of declared calorific value be maintained in accordance with the provisions of the Gas Regulation Act, 1920. The Committee expressed the view that there was a pressing need for a stricter control of gas quality and of distribution practice within the ambit of each Undertaking. The Committee did not feel it desirable to suggest any detailed specification, but recommended that each Undertaking, having selected and declared the calorific value best suited to its local conditions, should rigidly maintain the calorific value, specific gravity and purity of the gas and the pressure of supply within the closest practicable limits. Certain tolerances were suggested, and it was emphasized that the evidence before the Committee showed that the greatest source of complaint by the consumer was excessive variation in gas pressure at his appliances.

The views of this Committee on the paramount importance of regular pressure at the consumer's appliances are worth stressing. The Industry has not paid sufficient attention to this matter of gas pressure and consequently, as the Report states, "present distribution practice is generally less satisfactory than present gas manufacture

practice, and requires much closer attention in the future than hitherto." Present-day practice in the Gas Industry is largely limited to the control of pressure from certain centres either at the Works or on the district. The best such an arrangement can produce is to minimize the variation in pressure created by a varying district demand. The results are definitely unsatisfactory from the point of view of the service and maintenance engineer. If the Industry would be prepared to take action and equip each consumer's premises with a governor, then much that is now unsatisfactory to the consumer would be removed and the servicing and adjustment of appliances would be more easily carried out.

I would commend this Report on Gas Quality to each member of the Institution who controls the supply of gas to the consumer, and suggest that he should consider his own conditions of supply. These simple and clear recommendations should be the target for every Gas Undertaking, since they are capable of immediate attainment.

Sulphur Removal.

The Committee recommended an evolutionary policy. It first drew attention to the fact that owing to the effects of the products of combustion of sulphur compounds in town gas, the use of gas for space heating was limited and the prestige of the Industry was prejudicially affected. The Committee recommended that as a first step the organic sulphur compounds in all supplies of town gas should be reduced to 10 gr. per 100 cu.ft. before the gas is distributed to the public, and that immediate steps should be taken by all Gas Undertakings, as soon as circumstances permit, to achieve this result. The Committee drew attention to the advantages which accrue when the sulphur content is reduced still further, but recommended that the possibility of obtaining a lower limit than 10 gr. of sulphur per 100 cu.ft. should not be allowed to cause delay in giving effect to its main recommendation. The general adoption of benzole removal during the war has resulted in a reduction of the organic sulphur content of gas, and by normal benzole recovery processes the gas from the carbonization of coals with very low sulphur content will in many cases be found to be below the desired figure of 10 gr. By the adoption of high oil-circulation rates, active carbon or catalytic methods, it is possible to reduce the organic sulphur to the required figure. It is beyond any question that the reduction of organic sulphur in town gas to the figure recommended by the Committee of Enquiry would be a great advance, and every gas engineer should see to what extent he can meet these requirements.

Standardization of Appliances.

The Committee of Enquiry limited Part I of its report to the consideration of domestic gas cookers. The Committee came to the conclusion that there was no general measure of agreement in the Gas Industry in favour of a nationally-standardized cooker. It considered that there was general agreement that a measure of rationalization was desirable, which would be of benefit to all. As a means of putting into effect a policy of rationalization to be applied to all new designs of domestic gas cookers, the Committee made the following recommendations:

(*a*) Each manufacturer should make the component parts of his own series of cookers interchangeable to the maximum extent, and should reduce to a minimum the number of models in current production.

(*b*) The number of sizes of all domestic gas cookers should be limited to four, with a limit of three sizes for the lower-priced models normally supplied to prepayment consumers.

(*c*) All gas undertakings should agree not to ask manufacturers to make minor alterations, and all manufacturers should agree not to make any such modifications to their standard series of cookers to suit individual buyers.

It would seem that it would be to the advantage of the Gas Industry as a whole to accept these simple recommendations, and that steps should be taken to ensure that they receive the whole-hearted support of all Gas Undertakings and appliance makers.

Coke Quality.

The Committee of Enquiry on Coke Quality divided its work into two parts, the first section relating to sizing of coke, and recommended that all coke, for whatever purposes required, should be screened before sale to the consumer, and should be sold according to a numbered size to be adopted as standard throughout the country. Here again the recommendations are simple and, to be carried into effect, require only the conviction of the Industry that they are sound.

In the second part of its report the Committee called attention to the fact that the supply of coke either for existing open coal grates or for special coke-burning appliances is likely to be a matter of considerable importance for some time to come, and urged that everything should be done to improve the quality and preparation of gas coke and the design of coke-burning appliances. The Committee suggested that the Gas Research Board should be requested to obtain the necessary information concerning the methods and economics of producing cokes of better quality, including the question of activating the less reactive types.

It is hoped that this brief account of the work of the four Committees of Enquiry will clearly demonstrate the value of the findings. My main purpose in referring to them is to emphasize that the Gas Industry has it within its own power to make improvements along the various lines suggested, without revolutionary change in its organization, and without any additional legislative powers.

Research

Since the Institution's 80th Annual General Meeting in June, 1943, the Gas Research Board—the Research Association of the British Gas Industry—has consolidated its position. A matter of outstanding importance has been the appointment as Director of a man who is well known in the world of fuel research. The selection of Dr. J. G. King for this post was of particular interest to me because of the fact that I had been privileged to carry out two different investigations in collaboration with him at Edinburgh.

Although these particular programmes were arranged as between the Fuel Research Station and the Edinburgh Gas Department, Dr. King has already made it clear that he looks forward to collaboration on similar lines with Gas Undertakings for the carrying out of much of the large-scale work of the Gas Research Board. I feel, therefore, that it may not be out of place for me to summarize the procedure adopted in carrying out these examples of large-scale collaborative research work at Edinburgh, as well as to outline the nature of the actual investigation.

Following an offer of facilities for co-operative research which I made to the late Dr. F. S. Sinnatt, then Director of Fuel Research, arrangements were made for several programmes of research to be carried out at Granton Gas-Works, Edinburgh, by the Works staff, according to a programme drawn up by Dr. King, aided by consultations with Mr. T. C. Finlayson, representing the Woodall-Duckham Companies, the builders of the plant on which the experimental work was to be carried out.

The three programmes agreed upon were as follows:

(1) An investigation of the gas-making qualities of Scottish cannel and of the nature of the products obtained, with special reference to the yield of tar and to the production of motor spirit and oil from this tar.

(2) An investigation of the possibility of improving the quality of the vertical retort coke made from the Scottish bituminous coals with a view to the production of coke suitable for domestic purposes, and particularly for the open grate.

(3) An investigation of the conditions governing the production of benzole or spirit from Scottish coals in vertical gas retorts, and the possible modification of these conditions to increase the yield of benzole or spirit.

A start was made with the first programme in December, 1934, and the results were presented in the form of a Paper to the Annual General Meeting of the Institution in May, 1936.* The second investigation was carried out during 1937 and 1938, and the results were made available to the Gas Industry in a Paper presented to the Autumn Research Meeting of the Institution in November, 1938.† Difficulties associated with staffing under war-time conditions prevented the third programme from being carried through.

The procedure in each case was the same ; the detailed programme of tests was drawn up and discussed, and then the actual work was carried out by the Edinburgh staff on the test installation of continuous vertical retorts. All routine examinations were made at the Works, while any special testing was done at the Fuel Research Station. The results were jointly examined by the Edinburgh and Fuel Research staffs and finally published in the Papers already mentioned.

The cannel coal investigations arose from the William Young Memorial Lecture given in 1933 by Dr. F. S. Sinnatt. In this lecture reference was made to the fact that low-temperature tars were much more amenable to hydrogenation than were high-temperature tars. My experience at Edinburgh had shown that tar from cannel coals carbonized at normal temperatures in continuous vertical retorts was quite different from tar produced from bituminous coals, and it was thought that if cannel tars proved to be amenable to treatment by hydrogenation, then one might have at the same time a process making a high yield of gaseous therms, a high yield of easily-hydrogenated tar, and a coke of marketable quality. Newbattle cannel was selected for the investigation and a number of tests carried out. Using this material, surprisingly good results were obtained. It was found possible to produce 90 therms of gas with a calorific value of 480 B.Th.U. per cu.ft., together with 4 gall. of refined spirit and 40 to 50 gall. of tar per ton of cannel. The yield of coke was about 7 cwt. per ton and was found to be strong, hard and combustible. The tar was found to be as amenable to hydrogenation as low-temperature tar, in spite of the high-temperature conditions of carbonization. The make of gas per retort per day was above normal and no operating difficulties were found. Although there has, as yet, been no opportunity of commercializing this work, it has been established that if supplies of suitable cannel again become available and if there grows up a home market for easily hydrogenated tars, then standard gas-making plants can produce such tars as an adjunct to normal gas manufacture.

The object of the second programme of research was the production in normal continuous vertical retorts of a coke which would be suitable

* Jamieson, J., and King, J. G., "Products obtained by the Carbonization of Scottish Cannel in Continuous Vertical Retorts," *Trans. Inst. Gas Eng.*, 1935-36, **85**, 1010.

† Jamieson, J., and King, J. G., "The Production of Free-burning Coke in Continuous Vertical Retorts." *Trans. Inst. Gas Eng.*, 1938-39, **88**, 387.

as a fuel for the type of open grate normally installed in houses, and not specially designed for fuels less free-burning than bituminous coal. The basic idea of the investigation was to select these weakly-caking coals, which when carbonized in lump form combine the advantages of the greater combustibility of continuous vertical retort coke with the higher reactivity associated with cokes formed by the carbonization of coals which do not intumesce to form a secondary cell structure. Although of special interest to Scotland, coals of similar type are to be found in Northumberland and the South Midlands. Eighteen coals were examined at the Fuel Research Station and five were selected for full-scale test. The tests were carried out in the installation of continuous vertical retorts already mentioned. The combustion chambers were about 200°C. below normal; the throughput of coal was normal for the size of retort. No operating difficulties were experienced. It was established that solid fuel could be produced in this way, sufficiently reactive to be ignited readily and to burn freely in the open domestic grate.

In this connexion I think we should try to preserve a reasonable perspective on coke. We have heard a good deal of late about the complete gasification of coal, and it has recently been disclosed that new processes designed to give a high calorific value gas have worked well with plants built on a laboratory scale.

These disclosures are interesting and encouraging, but they are also dangerous if they lead to the neglect of our coke business. I have heard it said that we need a good process of complete gasification because coke does not pay for its cost of production. The assertion will hardly bear critical examination. We cannot, of course, readily separate the costs of coke production because it is an integral part of the gas-making process as practised to-day, but we do not need any such separation of costs to be able to say that, up to the present, coke has paid, for the reason that no process of carbonization which eliminates coke has so far been found which will result in a cheaper therm of gas at the consumer's meter. That is the acid test, and on that test it would be equally false or true to say that gas-making does not pay.

Then there is the question of efficiency. The Gas Industry bases its claim to recognition as an essential fuel industry to a great extent upon the high overall efficiency of its processes of production and utilization. We must ask ourselves whether this claim to recognition will be assisted more by research in complete gasification or by research in other directions—say in coke utilization. In some recent calculations of the overall efficiency of the Gas Industry the efficiency of coke utilization has been taken as that of the open domestic coke fire, while little account seems to have been taken of the much higher efficiencies with which coke is used in closed stoves and in boiler installations, even although these two uses accounted for by far the greater proportion of coke sold in the immediate pre-war years. Even, however, if we base efficiency calculations upon domestic uses only, the proportion of the thermal value of the original coal which remains in the form of coke is so high that a comparatively small increase in the efficiency of domestic use would increase very materially the figure of overall efficiency. For that reason, and having regard to the great possibilities in this direction, the improvement of appliances for coke utilization does seem to merit a more generous share of our research effort, and the work of the Technical Committee of the National Federation of Gas Coke Associations deserves every recognition and encouragement.

I should like to make a brief reference to a further investigation carried out in conjunction with the Fuel Research Station on the deterioration of coal on storage, the results of which were discussed at a special meeting of the Institution in March, 1939.* The purpose of the work was to ascertain the effect of storage on the gas-making properties of the coals commonly used by the Edinburgh Gas Department. Twenty Scottish coals were selected and laid down systematically in heaps of about 8 tons each, portions being removed at intervals of 15, 24 and 44 months for analysis and carbonization tests. In addition, seven of these coals were laid down in heaps of 200 tons each, and after a period of 44 months removed for carbonization in the test installation. The analytical data obtained were largely in agreement with existing knowledge, as, for instance, the slow oxidation of the coal and the loss of caking properties. The experimental work carried out seems to indicate that it is not desirable to place in storage coals of low caking index for use in gas production, especially because of marked increase in breeze production. Coals of good caking qualities will give less trouble and yield a reasonably massive or coherent coke, but some knowledge of the capability of these caking coals to retain their caking properties should be available in making a selection.

I have outlined these three investigations as being examples of research work which can best be carried out by collaborations between Gas Undertakings and Research Organizations. In each case a large quantity of coal was necessary; in each case the work was arranged to fit in with normal gas-works production requirements, thus considerably reducing the cost of the investigations.

Under the direction of Dr. King the collective research of the Gas Industry is in able and experienced hands, but as has been pointed out by Dr. E. V. Evans, our immediate Past-President and Chairman of the Gas Research Board, the success and value of the Board largely depend upon there being available a body of well-trained and well-informed men who can appreciate and apply the findings of the research workers. I feel that it is desirable to emphasize that this support should be found among the membership of the Institution.

I hope that all members will regard it as a duty to keep closely in touch with the publications of the Board, and I look forward to the time in the near future when the research Reports may once more be the subject of discussion at our Autumn Meetings.

Finally, I cannot leave this subject without asking you and myself the question—what is the relationship between The Institution of Gas Engineers and the Gas Research Board so far as the general technical direction of the Industry is concerned? The Institution was primarily responsible for bringing into being the Gas Research Board—prior to its formation the Industry's centralized research work was carried out by a Committee of the Institution. To-day the majority of the Council of the Gas Research Board are appointed by the Council of the Institution; consequently the Institution has a direct responsibility for the success or failure, partial or otherwise, of the work of the Gas Research Board. The first responsibility of the Gas Research Board, however, is not that of technique, but of initiative for subjects for investigation and the conduct of research. I am making this point because I am a strong believer in "the cobbler sticking to his last." The Gas Research Board has plenty to do in executing the research requirements of the Industry, and the matters of research with which it deals should include not only subjects of a fundamental nature, but also those important long-distance subjects upon which no one individual undertaking or contractor could embark. In short, the Gas Research Board should act for the Industry on all research matters, but be limited to that. There should not be too great a disposition to utilize the services of the technical men connected with the Board on matters outside the research programme which has been set by the Council, nor should they be used in a miscellaneous advisory way. If the Industry is to have a technical information bureau, it should be associated with The Institution of Gas Engineers, and all enquiries on technical matters other than research and requests for technical assistance should be made to the Institution.

The existence of the Gas Research Board will not relieve the Institution of the responsibility for general technical supervision and advice in the Gas Industry. The Institution will still have to deal with those everyday questions of plant and processes which it has always dealt with, and will still have to advise members and outside authorities on technical problems which may be raised from time to time. In considering such problems there may arise questions involving research, and it would be appropriate for these to be referred by the Institution to the Gas Research Board.

Of all the enterprises that have been initiated in recent years by the Gas Industry, the Gas Research Board would appear to me to be the one that could, if properly handled, bring about the greatest return to the Industry and to the nation as a whole. We must give it our strongest support and deal with the broad question of research in no mean manner.

"Let us, then, be up and doing,
With a heart for any fate;
Still achieving, still pursuing,
Learn to labour and to wait."

The Annual General Meeting

In conclusion I wish to express to all members of the Institution and to the visitors whom we had hoped to have with us my very deep regret that it has been necessary, almost at the last minute, to cancel the arrangements for holding the 81st Annual General Meeting of the Institution in Edinburgh this Summer. At this great moment in our history, when we cannot foresee from day to day what blows or counter blows may be impending, it is the clear duty of every responsible gas engineer to remain ready at his post. We had hoped to offer you a pleasant and profitable visit to Edinburgh, and our Lord Provost, Magistrates and Council had planned to receive you with all the hospitality for which they are well known. The inevitable abandonment of these plans has filled us all in Scotland with the keenest disappointment.

[Mr. Jamieson concluded his Address by giving two Appendices outlining the development of The Institution of Gas Engineers and other Allied Bodies, and the District Associations affiliated to the Institution.]

* Jamieson, J., and Skilling, W. J., "The Deterioration of Coal on Storage," *Trans. Inst. Gas Eng.*, 1938–39, **88**, 663.

Institution Officers and Council

At a Meeting of the Council on June 13 it was reported by the Scrutineers of the Ballot that the following Officers, Auditors and Ordinary Members of Council had been duly elected, in accordance with By-Law 49.

President, 1944–45.—S. E. Whitehead, J.P., B.Sc., M.Inst.C.E., M.I.Mech.E. (Southampton).

Vice-President, 1944–46.—G. C. Pearson, M.Inst.C.E. (Birmingham).

(The Vice-President remaining in office is Colonel C. M. Croft, D.L., J.P., M.Inst.C.E. (Wandsworth).

Auditors, 1944–45.—Colonel H. C. Smith, C.B.E., D.L., J.P., M.Inst.C.E. (Tottenham); Alfred Morland, F.C.A., Wood, Drew & Co. (London).

Honorary Secretary, 1944–45.—John Terrace, M.Inst.C.E. (London).

Ordinary Members of Council, 1944–47.—C. H. Chester, O.B.E. (Swindon); J. T. Haynes, Assoc.M.Inst.C.E. (Bournemouth); C. F. W. Rendle (Redditch); R. J. Rogers (Birmingham).

Research in Industry*

By J. G. KING, O.B.E., D.Sc., Ph.D., A.R.T.C., F.I.C.,

Director, Gas Research Board

IN recent months the need for a greater volume of research in Great Britain has received a good deal of publicity. Although it has been recognized that the quality of research done in this country has been as high as in any other, adverse comment has been made upon the magnitude of the effort made, particularly in relation to industry. While the measure used, that of money expended, is not entirely fair, the criticism must be accepted as largely justified in that modern scientific discovery has not been applied quickly enough. Many reasons have been given, but perhaps the chief are (*a*) the secondary position occupied by scientists in many industries, (*b*) an educative system which has not given adequate training for industry, and (*c*) a lack of intensive effort in the method of application.

The proposals which have been made to improve the position have dealt mainly with finance, and the accelerated and extended training of scientists to undertake extended programmes after the war. They have not dealt adequately, except in the case of Sir Lawrence Bragg's presidential address to the Physical Society in 1942, with the difficult subject of the administration of the funds provided so as to achieve the best results.

Research may take a number of forms between the extremes of fundamental studies made for the general advancement of science and with no special thought of application, and the strictly utilitarian research which is applied to a definite object, and may be abandoned without hesitation should failure to achieve that object be foreseen at any stage. The particular type of research with which the Gas Industry is concerned has been called industrial research, but such a title is misleading in suggesting some limitation of level or scope which may not be intended. The general object of research in industry is to raise the standards of efficiency, initiate new processes and, by the study of scientific principles, arrive at a better understanding of the processes involved. Only the realization of this object will lead to high levels of efficiency and achievement, but, more than this, it does seem that the very life of any industry may come to depend upon its having a sufficiently live research group to keep it in the forefront.

It is not altogether correct, however, to distinguish between industrial research and pure and fundamental research. Lord Cherwell has said that His Majesty's Government intends after the war to increase financial assistance to pure research and has invited similar proposals for industry. Industry, however, calls for research in all its forms and has, indeed, contributed in the past many advances in pure science. It calls for research personnel having the highest academic qualifications and, moreover, demands from many of these practical training in the technique of the industry they serve. Industrial scientific problems, whatever their economic limitations, are solved more readily by the research mind than any other. A team suitably balanced with the right components is therefore the prime objective in providing an industry with the best assurance for its future.

Sufficient money, while secondary, is also an important factor. Although the measurement of research effort in terms of money is admittedly wrong, it must be recognized that there is a minimum below which any expenditure at all would be wasted. It should also be clear that administration absorbs funds, and that to double the amount made available will much more than double that actually expended on research. The first action in the research plan, therefore, must be to construct a machine to carry out what seems to be an adequate programme, set it in motion and decide later whether it is adequate or not. The only precaution necessary in such a course of action would be to allow more than sufficient scope for expansion should it emerge that the first assessment had taken too limited a view. The purpose of this Paper is, therefore, to give the technical people in the Gas Industry an idea of how the scientists of the Gas Research Board will function and to ask for help and co-operation.

Centralization.

The ability to do creative research is an indefinable gift which belongs only to the individual. Collective research may be a very different matter. In the first place, it must have a background of organization which will not only make full use of the ability and inspirations of individuals, but will provide them with the weapons they require, in the form of an intelligence service, workshops, equipment and skilled assistants, so that distractions from the basic problem are reduced to a minimum. The only sound way to achieve this is to centralize a large proportion of the research effort round the essential services, and to make the latter also embrace the activities of any groups which may from the nature of their problems have to work in the field. Only by centralizing a large proportion of the effort can the expenditure per unit be kept at the minimum, which experience has shown to be of the order of £40 per unit of working staff per annum for chemicals, apparatus, stores, gas, electricity, and water, and workshop facilities.

* Paper to the Institution of Gas Engineers.

Scientific Staff.

The first consideration must be the quality of the scientific staff. Money and equipment alone will not produce results without the man. The Board already has a nucleus staff who have proved their value, but the staff and facilities available must be expanded as soon as conditions permit:

(i) To provide young men of high qualifications who will contribute youth and new ideas.

(ii) To provide each research worker with scientific assistance in sufficient proportion to make full use of his abilities.

(iii) To provide an intelligence service to guide the reading and save the time of the research staff.

(iv) To provide workshop facilities to enable new apparatus to be constructed rapidly and to special design.

The training of the new staff is a serious consideration. Research in industry calls for an intimate knowledge of the processes of that industry, and no training, however sound, will quite replace practical experience. The problems of the Gas Industry cover a wide field in which chemistry (mainly physical), physics, engineering and chemical engineering, combustion and heat transfer all play important parts. Research staff must therefore be chosen carefully to provide specialists in each field so as to preserve the correct balance in tune with the requirements of the Industry. If these specialists have industrial experience so much the better, but where they have not it will be necessary for the Director to arrange training as early as possible in their service. In many of the fundamental researches which have limited horizons industrial experience may not be essential, but it will be part of the plan to see that every member of the staff is given training. Only in this way will the staff as a whole be made fully adaptable, and be able to meet on equal terms the technicians in industry who will apply the fruits of their work.

In order to make the fullest use of scientific staff they must have assistants in sufficient number to do all the ancillary work and to watch experiments perhaps 24 hours per day; this is an important variation from normal academic research. The relative number of assistant staff must vary with the kind of work, but would consist of—

(i) Boys or girls who are working their way through evening schools towards an academic qualification.

(ii) Laboratory assistants skilled in the art but unlikely to achieve high academic qualifications.

(iii) Skilled labourers who are capable of controlling continuous experiments on shift work either on laboratory or intermediate scale.

The first class are valuable to the research worker in having or acquiring academic knowledge, and also form a source for recruitment to research or industrial appointments.

The second are more likely to remain in the research atmosphere, and have a special value in thereby forming a solid background of experience which helps considerably in smoothing the path of new recruits to the research staff.

The third class constitute the cheapest method of controlling semi-scale experimental work but probably also the most effective, since their intelligence level is such that they can concentrate within such limited horizons as maintaining constant temperature or pressure conditions or rates of flow, with a success which is usually denied to research assistants with wider interests.

It is more than important that teams which are built up to attack research problems should be carefully balanced as to these three types of staff, each problem requiring a different distribution.

It is not intended to convey the thought that a staff should be regimented so strictly that the freedom of action of individuals would be prevented. This would obviously be unwise, since one spark of inspiration may sometimes outrun long periods of organized work. That proportion of the work of an organized group which would be conducted according to plan should certainly be high, but there should always be a proportion free to follow inspiration. Since inspiration cannot be forced and basically new ideas occur only seldom, it is not likely that this proportion could ever become so large as to disorganize the general programme of work. It would, however, have to be within the discretion of the Director for any member of the staff to diverge from organized work to follow inspiration.

In any centralized research there is a danger of stagnation if there should not be a constant flow of fresh brains to provide new thoughts and inspirations. The Gas Industry can help to provide this flow by absorbing into executive posts men who have played their part in research work and are ready to apply their training in the wider sphere of application, or men who have not found in research the best outlet for their gifts. It is devoutly hoped that this will come about and, if it does, it will serve the two-fold purpose of keeping the research group continually refreshed, and of building up in industry an executive personnel of the highest scientific quality.

Intelligence and Contacts.

A research establishment cannot afford to be ignorant of the work of other establishments working on the same or similar lines or of the results of general scientific work bearing upon their subjects. It is probable that a Central Bureau will be constituted by the Department of Scientific and Industrial Research to collect and distribute all fuel abstracts, to prepare bibliographies and memoranda, and collect translations of foreign work. This arrangement cannot excuse the other Research Associations concerned from having their own intelligence departments, but will leave the latter more free to extend in other directions.

In the case of the Gas Research Board, the intelligence service will be operated to serve the following purposes, and should not require more than two intelligence officers, a librarian and typists:

(i) To prepare specialized abstracts for the Central Bureau. The research staff will have to help with these in order to make them thoroughly informative.

(ii) To keep up to date a subject and author card index with abstracts of the whole field of the Gas Industry in all countries; to circulate these at regular intervals to the research staff and to staffs in Industry.

(iii) To prepare, summarize and publish information from the literature, as and when called for, in the form of (*a*) collections of abstracts, and (*b*) collated monographs prepared by experts.

(iv) To maintain a library of essential text-books and a borrowing service with the central libraries.

Fears have been expressed that a central research station may lead to insularity, but this need not be so if precautions are taken against it. The precautions below are not novel, and have proved effective in other similar establishments:

(i) Attendance at scientific meetings: members of staff specially allocated to attend on different subjects.

(ii) A local scientific society in which it would be compulsory for each member of the scientific staff to describe his own work at intervals.

(iii) Full contact with work in industry as detailed below.

(iv) Periodic visits of senior staffs to other research establishments and to universities, both at home and abroad.

(v) Frequent interchange of staff personnel on teams doing field and extra-mural work.

(vi) Visitation days for the technical men from industry with presentation of research results.

A determined effort to maintain such a system might be necessary, but there is no reason why it should not be sustained. It should, with the suggested transfer of senior staff to responsible posts in industry, provide a complete insurance against stagnation.

Workshops.

An important part is played in the life of the modern research worker by the necessity for apparatus and the avoidance of delay in obtaining it. No group of research workers can function without loss of time unless they have the services of a well-equipped workshop. In such a workshop time is saved by avoiding the necessity for drawing the apparatus to specification; it can be built from sketches through collaboration between the mechanic and the man who requires it. It would be quite accurate to say that it grows, and that this collaboration saves time, avoids expense and is mutually helpful.

A workshop, with a foreman having design experience, four instrument makers, a labourer and one glass blower, is sufficient for a scientific and assistant staff of 50, and will cost in wages and stores (1939) £1,800 per annum.

Analytical Laboratory.

Every research worker is faced with the necessity for analytical or test work, depending in its amount on the nature of his work. Analytical methods frequently require special apparatus, *e.g.*, for gas analysis, which it would be unwise to duplicate in each research programme. A central analytical section organized to give a measure of mass production is therefore a very necessary part of any research organization. The number of assistants necessary in any research group can then be cut down to the minimum for the active conduct of the research.

An analytical laboratory requires a qualified chief who can apply approved methods, improvise special methods and, by good organization, maintain a high output. His staff need only be of the semi-trained type, such as students in training for higher qualifications or laboratory assistants. In work of the Gas Research Board type, an analytical laboratory with an officer in charge and seven assistants could be run at pre-war prices for £1,500 to £2,000 per annum, including all expenses other than rent.

Extra-Mural Work.

It is intended that the Board's headquarters staff will not do more than laboratory and intermediate-scale research, and that other work will be arranged on industrial plants. The Council is confident that when any problem arises there will be no lack of offers from industry to provide the necessary facilities. Extra-mural work of the type visualized falls into the following groups:

(i) Research involving the operation of existing full-scale plant.

(ii) Research involving the use of large quantities of material, such as coal or gas.

(iii) Development work from earlier laboratory-scale research.

(iv) The introduction of new full-scale processes.

There have been many examples where the conduct of the research has consisted in taking observation upon a plant in operation. In common with other industrial Research Associations, the Gas Research Board has the advantage of being able to work on plant owned by its constituent members, without having to face heavy charges for the capital cost of the plant or for the raw materials required to operate it. In investigations of this type, Research Associations are in a much more favourable position than research stations attached to Government Departments.

The same position obtains when large quantities of raw materials are required. In the case of (iii) the Gas Research Board must, with new processes, undertake development in stages until it can be visualized that the process is under control up to the full scale, or to such a scale that it can be taken over by a development centre or a contractor. The introduction of a process or appliance on a full scale would be the function of the research department only when its essential mechanism had not been fully explored. A current example is the Lurgi process of complete gasification, which involves the difficult problems of the suitability of British coals, the introduction of high-pressure operation and the provision of a cheap oxygen plant.

In order to implement extra-mural work of the above types, it is necessary to maintain teams of suitable staff, each under an efficient leader, the teams being based upon headquarters, but sent out for periods to carry out the work and then return later to examine the results. In the past work of The Institution of Gas Engineers there have been many examples where industry has provided the necessary facilities, and the Board is already indebted to one company for practical assistance and to a number of others for offers of help.

It could not be other than essential in an industrial Research Association to conduct extra-mural work of this type. The immense value to be gained in collaborative effort between industrial and research staffs would demand it even if the saving in cost was not a complete justification. One difficulty remains, however, perhaps the only one in this entire scheme—that no matter how much the personnel of such teams is altered, some of them may have to carry out a high proportion of their work away from home. Unfortunately, no sound way of overcoming this suggests itself.

A further method of conducting research, which might widen its sphere of interest, consists in assisting the technical staffs of small Gas Undertakings to carry out such investigation as might be possible with their facilities. With adequate guidance from the Director a large number of small investigations could be kept active, and the works chemist or engineer stimulated in his everyday work and interests.

UNIVERSITIES.

A tremendous task faces the scientific department of Universities after the war in satisfying the already apparent demand for more research workers. Not only will they have to accommodate young men returning from the Forces, but they will have to organize more facilities for the teaching of research methods to post-graduate students, particularly methods applicable in applied research. The conditions before the war in which only a small proportion of the graduates continued their studies must be changed by increasing University staff, laboratories and equipment, and above all by special research training to suit the requirements of industries such as the Gas Industry in the manner now being done so well by Professor Townend at Leeds. Such training cannot fully take the place of practical experience, but will help to prepare men to absorb that experience quickly when it comes.

Into certain of these schools it is suggested the Gas Research Board should introduce one or more research workers, each conducting relatively "short-term" researches on the lines, and within the subject of the Professor's work. These men would have the advantage of using expensive equipment which, by infrequent use, could not be justified at headquarters, and would also absorb new techniques and new ideas. When in due course they returned to the headquarters they would carry the latter with them and spread the knowledge among the staff. In this country not every University has special traditions, though with national encouragement there could be more, and the Gas Research Board could well afford to place men in at least six of them. These men would in turn bring to the University contacts with their industry which would benefit both Professor and students.

Post-Graduate Research.

A further method of utilizing more fully the value of specialist Professors would be to provide funds for post-graduate research on the lines of the D.S.I.R. University Grant scheme, but under conditions allowing the Director and Council to select the subject of the research. Such an arrangement could produce valuable results:

(i) The student would be trained in research.

(ii) He would by the nature of his work and his contacts with the Director be stimulated to an interest in the industry from which the subject of the research had sprung.

(iii) Small *ad hoc* investigations which were offshoots of the main researches of the Gas Research Board could be cleared up without distracting the attention of the Gas Research Board staff.

(iv) The senior officers of the Gas Research Board in whose section the researches belonged would be stimulated to visit the Universities at regular intervals and refresh their knowledge thereby.

Post-graduate research grants of this type would amount to £150 to £250 per annum each and the Gas Research Board might well support up to ten, depending upon the rate of flow of *ad hoc* problems.

Collaboration in Industry.

Certain aspects of collaboration between technical staffs in industry and the research staff of the Gas Research Board have already been suggested above, but there are wider aspects which require consideration before a picture can be seen which shows the necessary complete continuity from fundamental research in the laboratory to the plant in full operation, or to the enlightened and efficient use of the industry's products. The main components of the picture are:

(i) The researches of the Gas Research Board.

(ii) The larger Gas Undertakings which support research teams.

(iii) The Industrial Gas Centres, of which there are at present eleven, and whose terms of reference are intended to embrace general technical and development work.

(iv) The contractors (member firms of the Society of British Gas Industries) who build plant and appliances of all types.

(v) The service laboratories visualized by Dr. E. V. Evans in his "Target for To-morrow."

It would be wise to assert at the outset that whereas these bodies must each play its part, there must not be a rigid line of demarcation between them. The main function of the Gas Research Board lies in the field of fundamental research, where it is assisted by the research staffs of the larger undertakings. Where its researches, however, involve translation to a larger scale or to the development of prototype plant or appliances, it will require careful consideration to decide where the research staff should change from an executive to an advisory and finally consultative capacity. In some researches the difficulties of the problem may be such that the research staff should continue their work into the development stage, but generally it would be wiser for them to leave development work to the other sections which are better equipped to do it.

The Industrial Gas Centres are so equipped only in some instances, mainly London and Birmingham, and steps should be taken as soon as possible to extend the other Centres and provide them with the same facilities. The whole scheme would then work for the Gas Industry as a whole. In some cases, however, the magnitude of the effort might be beyond even their capacity and (iv) would then be called in to collaborate.

A permanent policy could be based upon consultation at every stage whereby on any doubtful subject an agreed decision could be taken as to the best course of action. In his presidential address of 1942 Sir Frederick J. West rightly drew attention to the facilities which the contractors have for research. When the Gas Research Board and the Industrial Gas Centres are fully constituted there should remain no doubt that the whole field from beginning to end was fully covered. Dr. Evans has drawn attention to the need for service laboratories which would deal with the day-to-day technical problems. If and when these laboratories are formed, they can fit into the general picture not only in discharging their designed function but in directing attention to the need for detailed investigations to solve the problems of everyday work. Again consultation would have to decide whether the research group could help best by taking over the problem, or by giving advice so as to enable a solution to be reached locally. Each case would have to be considered specially, but clear cases in which the research group should take over would be those in which the research equipment necessary could not be made generally available, or in which the attention of a specialist available only at research headquarters was required. Alternatively, if the problem could only be solved by the development of apparatus, then it would be an obvious case to turn it over to the Industrial Gas Centres, which would in turn suggest when it became the function of a contracting firm. Throughout the whole range the Director of the Gas Research Board would maintain a continued interest, which, as stated above, would be advisory in problems not quite dissociated from research and consultative in others. There seems no reason why with each group fully developed to play its part there should not come into being in this manner a scientific background for the Gas Industry which would be complete n every part.

Full-scale Plant or Appliances.

One field in which collaboration can be visualized between the Gas Research Board, the contractors and the Gas Undertakings lies in the introduction of a pilot plant or appliance of a type so novel that it constitutes a full-scale research. Such a situation will arise when the complete gasification of coal in hydrogen under pressure emerges from its intermediate-scale stage. A more pressing example is the need for a pilot plant of the Lurgi type to examine the gasification of British coals in steam and oxygen, and for an oxygen plant of a type suitable for the production of cheap oxygen in the Industry A research of this latter magnitude will call for co-operation between the contractor, the Undertaking which is to operate it, and the research staff which must examine its possibilities.

It would be wise for the Gas Industry to consider now how such full-scale research should be planned. In the case of a producing plant the choice of Undertaking would obviously be one in need of new plant so that, if successful, the pilot plant could become the first unit of a new station. The financial position is not so easy. The capital expenditure is too high to be met out of a research grant, and a decision will have to be made as to whether the capital expenditure on such a project should be borne by an allocation of capital from industrial funds, or whether it should be regarded as the type of capital expenditure from Government Funds as visualized in the Report of the Special Committee of the Federation of British Industries.

An experiment of this type would scarcely be embarked upon without a reasonable hope of success, and it would seem to be the more desirable procedure for the Industry to find such capital itself. There would always be the possibility of a monetary return if the plant emerged as a production unit. Similar schemes involving appliances for the utilization of gas or coke could be financed in the same way.

Industrial Research Associations.

The picture drawn above of the function of a research department in the Gas Industry would be incomplete without a brief survey of industrial Research Associations in general and their future. Much has been said of the prime importance of increasing University grants to stimulate teaching and research training, and to conduct fundamental or pure research. Sir Stafford Cripps, addressing the Parliamentary and Scientific Committee, visualized the spending of ten to twenty times as much as in 1938–39 if headway is to be made. Surely much of this increase must come by the extension of the Research Association movement.

In 1943 it was estimated that the 21 Associations connected with the D.S.I.R. would spend nearly one million pounds. To-day there are 26 such Associations and there will soon be 30, while a further four are independent. They must be encouraged to go further until all industries are served, and that of the Gas Industry must be built up with funds and equipment until it is worthy of the task it has to perform.

The Research Association movement should at some stage be linked with the research groups of the larger industrial companies, which already spend more money than such Associations. The special committee of the Federation of British Industries has stated that 566 firms spent in 1938 as much as £5.4 million. The linkage may be difficult, and can hardly be complete owing to proprietary interest in discoveries, but at the least it could be general so that the national interest can be served as far as possible. It is interesting to look forward to the time when every industrial unit has access to a research group or association, and these are linked together in all matters of common interest. In the case of the Gas Research Board special linkages will be necessary with all groups associated with fuel, but particularly with those of coke, tar, and benzole, whose problems overlap those of the Board.

The country will no doubt continue to have its own research departments, but as the Research Association movement grows, it would seem logical that their activities will diminish until they deal only with national problems such as health, mineral and other resources, or the requirements of the fighting services. It would seem unnecessary that they should continue to work on any problems associated with an industry served by a Research Association. The latter is in a much more favourable position, with an industry behind it into which it can divert staff, so maintaining its freshness, or from which it can obtain facilities of all kinds—space, laboratories, plant, or even large amounts of raw materials which, if purchased, would absorb too high a proportion of the research funds.

A national research group could, however, operate on new projects involving several industries, but which are as yet too remote to be explored by any. It could also undertake "long-term" pure research, although many authorities have agreed that pure research should become the speciality of enlarged University departments. National scientific groups may have an important function in advising H.M. Government on scientific matters, but how much better can this be done by industrial Associations, with their background of practical knowledge.

The elevation of Research Associations to the dignity of such office, and to that of acting as national standardizing bodies within the limits of their subjects, is surely a logical development of their connexion with the Department of Scientific and Industrial Research and the confidence shown in them by the granting of research funds.

An important consideration in the future of research associations is the provision after the war, if not earlier, of buildings and equipment to modernize the older establishments and equip the newer ones. The provision of funds to further research developments has received favourable consideration by H.M. Government, but these funds will avail little if priorities for buildings to house new staff under modern conditions are not assured. The Department of Scientific and Industrial Research is already giving consideration to the matter; it does seem that Research Associations, however, particularly new ones, must be assured of a share in the early part of the national rebuilding programme.

Training and Qualities of the Future Gas Engineer*

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WHEN requested by the President to write this Paper, the Author felt very conscious of the difficulties of the task, particularly in view of the unchartered developments of post-war reconstruction. The scope of this short Paper does not permit the discussion in detail of any of the subjects included in the Institution Education Scheme, as this is a matter for the appropriate Institution Committee.

The Status of the Gas Engineer.

The question of training, qualities and remuneration of the gas engineer has always aroused great interest. The status of the profession was improved when the Institution received its Royal Charter, but it will take many years to improve generally the standard of the gas engineer over the whole country.

The attainment of success in any administrative position obviously requires more than technical ability alone. A man must possess a quality of leadership and the power to get work done; he must be able to deal with all situations from the viewpoint of calm common sense and must possess courage. An optimistic outlook is of help. A man without these attributes would not be a success as a gas engineer, but he can be useful in the Industry as a specialist.

The public is not familiar with the profession of gas engineer. The Gas Industry has suffered from lack of publicity, and during the last thirty years other industries have made a more popular appeal to the interest of the public. In 1914, as a result of shortage of dyestuffs, attention was directed towards the chemical industry, and since then the internal combustion engine, film, wireless, plastics, aviation and electrical industries have all attracted attention. By comparison the Gas Industry may have been regarded by the public as old-fashioned and possibly decadent. As a consequence, the industries mentioned have no doubt received more than their fair proportion of the better type of men available, and in future the Gas Industry must endeavour to attract its rightful share of the best of the coming generation.

Effects of War.

In favour of the present-day gas engineer it can be said that after nearly five years of war the Gas Industry is still meeting the needs of the war effort and of the public, and while any subsequent remarks in this Paper may imply criticism of the gas engineer, it should be made clear that this applies to certain professional aspects only, and that, so far as the public is concerned, the training of gas engineers as a body must have been justified and their qualities proved. The selection of gas engineers appears to have been basically sound, since they have successfully survived the upheavals of the war. The manner in which some Undertakings have risen above difficulties and responded to increased demands is very praiseworthy. This extension of gas production is not, however, always accompanied by the economy and the standards of performance that will be essential after the war.

Gas Undertakings are peculiarly vulnerable to air attack and are exposed to risks over the whole area of their supply. In the meantime the demand for gas has largely increased. This has generally been satisfied, and there is no doubt that during the last five years the Gas Industry has risen to its greatest heights. The war has revealed that a number of Undertakings are so isolated that they are deprived of proper contacts, help and assistance. There are cases of men of proved ability and training whose qualities have tended to deteriorate after a few years of such isolation. This may be due to the fact that they are directed by committees or boards of non-technical men, and that their standards have probably become lower because of lack of healthy criticism. In post-war planning, engineers of such isolated Undertakings must no longer be allowed to continue without outside influence. The conducting of all Undertakings in the country should be subject to regular review from time to time by a competent body of technical men. This could be done by some arrangement under the aegis of the Regional Gas Engineering Advisory Boards, or by methods of integration. In the larger Gas-Works the value of a trained engineer and of technical control is fully appreciated, and the saving in coal by such control and management can be estimated. With the smaller Works this is more difficult to assess. There are approximately 647 Gas-Works which produce together only 7.5% of the total gas made in this country, but carbonize coal to the extent of two million tons per annum; it is obvious that the influence of these Works on the national fuel economy is substantial. From the Author's own experience during the war, it is suggested that on a conservative estimate 10% of this coal could be saved. The value of this to the country is apparent, but the value to the Undertakings is greater than may appear at first sight. During the last thirty years the net cost for coal has increased in the order of at least 500%, and whereas formerly it may not have been possible to pay adequate salaries in smaller Undertakings, it is now economically advisable to view qualifications and salaries in a more generous light. The man in charge of the smallest of Gas-Works should therefore have received a training that will allow a technical understanding.

The Gas Industry has now arrived at the cross-roads, and before discussing in detail the training and qualities of the future gas engineer, it might be advisable to attempt to envisage the future. It appears certain that in the organization of post-war reconstruction safeguards will be established to ensure that the nation's principal asset, coal, is processed economically. No Gas-Works will be free to carbonize coal without conforming to the direction of a higher technical control. The reconstruction of the Gas Industry may be on the lines of the Agricultural Committees, where each county forms a committee of selected farmers who advise and direct the working of individual farms.

There may be some analogy to be drawn from the development of the electrical industry in the 1920's. This was only achieved, along the lines of the present grid scheme, after long parliamentary proceedings, and much publicity was given to that industry during this period.

Post-War Planning.

It is likely that in the post-war reconstruction of the Gas Industry the various parliamentary and other proceedings, and perhaps inspired articles in the public press, will also bring the Industry into greater prominence. The possibilities thus revealed should serve to attract young engineers and fuel technologists who are desirous of seeking openings for their talents. In future the Industry may be directed on a national, regional, or municipal basis, or by combines of companies.

It is beyond the scope of this Paper to discuss the various means of post-war planning, but the following broad conclusions can be drawn:

1. Certain of the smaller Works may be closed down and production concentrated into suitably larger units.
2. The standards of performance of Gas-Works will be stricter, and greater attention will be paid to the yield of products and the fuel used.
3. Standards of calorific value, specific gravity, gas pressure, sulphur content, &c., will be formulated and strictly enforced.
4. The functions of the distribution engineer will be extended.
5. Gas Works may be subject to supervision by a democratic competent technical authority.

Training of Future Gas Engineers.

The foregoing must seriously affect the basis of training for the future gas engineer. In the past it has been adequate for a young trainee to secure his Institution qualifications and supplement these by practical experience in various posts. In this manner the junior engineer has obtained some managerial experience and practice in municipal or company administration. Progression has been made by moving from a small Undertaking to a better position in a similar one, or to a larger Undertaking. It would appear that this type of training will be of limited value in the future. The fulfilment of the five conditions enumerated above will imply that the functions of management will necessarily be separated from the functions of the engineer. Thus the members of The Institution of Gas Engineers will be expected to concentrate on the strictly professional side of their work. The duties of commercial management will be undertaken by separate individuals or boards, and the future gas engineer will emerge as a specialist.

It is to be hoped that eventually various Universities will establish suitable departments for the training of gas engineers, and it will be the responsibility of the Institution to see that this is done. This would entail financial aid from within the Industry, and provision should be made to enable a promising young employee to proceed to the University, with the aid of a suitable grant. All this will take considerable time, and members of the Institution must see that the interim period is covered.

The following are some practical proposals:

1. The Institution's Education and Examination Scheme should be adhered to loyally. Particularly welcome are the proposals for arranging the syllabus so that certain subjects are common with the training of other Institutions. It thus becomes possible for a talented young man to become also a member of other Institutions, leaving him a greater field for his future.
2. The system of residential Works appointments has always been a great drawback to the gas engineering profession. This was initiated when telephones were non-existent and transport difficult. In these days of improved facilities it is no longer necessary, and technical men should be released from these conditions. The best type of young men will not be attracted if they and their families are faced with the prospect of living in industrial surroundings. A ten-minute journey by car would generally transport these men to a more congenial neighbourhood.

* Paper to the Institution of Gas Engineers.

3. Facilities should be given for part-time attendance at a local educational institute. Any question of reimbursement of expenses should be viewed in a generous manner. University students should be given facilities for undertaking vacational work, in order to stimulate interest in the profession.
4. The question of salaries should be constantly reviewed. This is a very vexed question, but it should be appreciated that the young and promising entrant to any profession is concerned not only with his ultimate prospects, but also vitally concerned with his immediate remuneration. Men in the early thirties are often inadequately paid, and this is the time when their domestic expenses are likely to be heavy. The gas engineering profession will lose a proportion of the best men if it does not make provision for an adequate scale of salary during these years. In support of this it can be pointed out that Gas Works are very dependent for their efficient running on this type of man.
5. Advantage must be taken of the scheme now being organized by the Ministry of Labour for the future employment of trained men now in the Services. These brave and resourceful young men, who have been engaged in scientific and technical warfare, would be given a short training period (as described below) and would quickly absorb the principles of gas manufacture.

Regional Training.

The practical training of gas engineers should in future be on a regional basis. Pools of young men should be formed in each region or area, and these should receive training on a predetermined rota at Gas-Works in that region or area. Successful young men should not in future be required to spend years in the performance of certain restricted duties in a limited field. There should be a progressive acquirement of experience and knowledge, implying periods in selected posts in the Gas-Works of the region. The earlier stages of this training should include some actual work in the fitting shops and in the performance of such operations as water-gas making, &c. In this manner the training of young men would be vastly extended, and the Works engineers would be stimulated by receiving a succession of fresh, keen minds under their direction.

Young men train better when there is a sense of rivalry and such contacts should sharpen their intelligence. This system of training should enable young men with talent in any particular direction to develop as specialists, and there should be ample scope in the future for men with such special qualifications as chemists and distribution, mechanical, or civil engineers.

A record should be kept of their ability and of their experience at the various Works. These records could be conveniently lodged with the Regional Gas Engineering Advisory Board or other authority. Each record should contain a short comment by the engineer of each Works concerned. These comments should cover not only technical qualifications, but also character and aptitude. The Midland Gas Engineering Advisory Board has already given some consideration to a similar suggestion, and the following system of operation is proposed.

Regional Pools.

In the regional pool the men should retain the conditions of service of their initial employers. Thus, a large Undertaking would put, say, five men into the pool and a small Undertaking one man. These men would circulate on a definite rota, but would continue to draw their salary from their original Undertaking until they obtained permanent positions. By this means pension rights and privileges dependent on service would be retained.

Participating Undertakings would draw men from the pool for permanent positions, and the trainee would be replaced. This has a practical advantage in that an engineer selecting candidates for a permanent position will have a ready means of assessing the qualities of the various applicants. Not only will he have the record cards, but will be personally acquainted with most of the men and will know their capacity. Co-operation between regions will make these records available for filling posts outside the trainees' own region. The Author has had specific requests from young men in No. 9 Region to voice the foregoing proposals and such a scheme would be welcomed, and the men would be enthusiastic in their duties.

It is visualized that Gas-Works will operate in future in groups, and that each group will have its chief engineer, with station engineers at the various Works. There would be a system of control or supervisory engineers throughout the 24 hours at each Works, and a carbonizing engineer in charge of each retort house. Water-gas production would be in charge of a specialist. Some of these positions would be filled by the engineers from the pool, and there would also be opportunities for specialists in civil and mechanical engineering. By a regional training scheme young engineers would obtain some service with a larger Undertaking, and this is considered to be an essential for the future. There is a certain amount of knowledge which can only be easily acquired by service at large Gas-Works, for not only is the plant complete with modern retorts, electrical tar precipitation, vacuum still for benzole extraction, &c., but the engineer will become conversant with mechanical coal and coke handling plant and the use of coal stocking and retrieving machinery, railway practice and the laying of sidings. He will also have access to statistics of production for a number of varieties of coals, and results obtained from different types of carbonizing plant operating under varying conditions. He will become familiar with the methods of reinforcement of supply by booster stations, and the distant control of district governors.

As the results of the present research work are applied the technique of gas-making will gradually change. A fresh set of problems will develop, and these problems should be envisaged when planning the theoretical and practical training of gas engineers. The theoretical training is referred to later, but on the practical side the trainees must become accustomed to processes involving higher pressures than those in use at the present time. It is probable, for example, that steam pressures on the Works will be higher than the present usual range of 60 to 125 lb. per sq. in., and the design of ancillary plant such as exhausters and boosters may change. The pressures in the initial gas stream may be higher, and this would involve changes in the design of apparatus. The general codes of practice for operations in Works routine, such as shut-downs, repairs, &c., may require amendment.

All this will imply changes in the fundamental practical education of the trainee, and it is suggested that as many men as possible from the regional pools should be given short periods of actual operational work on any pilot plants that may be installed, either on production stations or at the Fuel Research Station. The experience gained could be publicized by Papers to the various Junior Associations.

THE FUTURE OF THE PROFESSION.

It is very difficult to forecast the future in this respect, but in general terms care should be taken to ensure that every young trainee be given opportunities to acquire experience as gas production technique develops.

Future prospects for gas engineers are better than they were thirty years ago. The facilities for training will also be vastly improved. The ultimate qualification for the entrant to the profession should be a University degree in Gas Engineering, plus the regional training herein described, facilities to be arranged to enable promising employees to obtain such training. The syllabus for the degree course should have special bearing on the physical and chemical considerations underlying the proposed developments in production practice, and it may be necessary to frame a special portion of the syllabus to this end. These measures should provide a number of young engineers of high technical and practical qualifications, who would be well equipped to appreciate and control those new processes of gas manufacture now in the experimental stage but which should be in full work during the next decade or so.

The Author wishes to thank the Birmingham Gas Committee for permission to write this Paper, and he is indebted to Mr. A. W. Smith for his constructive criticism, and to his assistant, Mr. F. H. Bate.

Parkinson & Cowan, Ltd.

A profit of £52,324 for the year ended Dec. 31, 1943, compared with £48,423 for the previous year, was reported at the annual meeting of Parkinson & Cowan, Ltd., held in London on June 8, when an Ordinary dividend of 5%, the same as the previous year, was declared. Gross earnings of trading subsidaries were £181,936, against £234,792. Provision for income tax and E.P.T. absorbed £108,862, and reserves for deferred repairs took £3,000, leaving the net profit of the trading subsidiaries for the year at £70,074, against £61,208.

Lieut.-Col. H. W. Woodall, Chairman and Managing Director, in a statement issued to the shareholders, said war conditions had not favoured the position of their overseas interests, which had again incurred losses. Certain changes had, however, been effected in recent months which it was hoped would improve their position in Australia. The diverse and widespread nature of the Company's wartime operations not only imposed a heavy strain on all their staff but was accomplished at a heavy financial cost, as evidenced by the trading results in 1939 and 1940. The change-back to peace time conditions was likely to be a prolonged and expensive period, during which they would have to face a general reorganization involving machinery processes and the re-absorption of returning employees.

The Government in its regulations had not shown great consideration to the financial results of undertakings that had patriotically turned over to wartime production, and certain demands to reopen contracts already agreed and settled did little to create that trust between Government and industry which must be attained if the country was to secure the great expansion of exports that they were advised was essential in order that we might be able to pay for necessary food and raw materials.

The wise and thoughtful speech of the Chancellor of the Exchequer when introducing the Budget, and the steps being taken by certain important Ministries in conjunction with industry to ascertain and provide for post-war requirements, would be widely welcomed, and would go a long way to establish that confidence without which no trading nation could flourish.

The constituent companies of the Group had weathered many storms since the foundations of the organization were laid 128 years ago. They were better equipped with staff and machinery than ever before. There would, after the war, be a large demand for the types of apparatus they produced, and he had no doubt they would successfully deal with the difficulties mentioned as and when they arose.

The Outlook of the Junior Gas Associations*

By H. PLATT, Chairman, and
A. BUJNOWSKI, M.C., Secretary,
Executive Committee of the British Junior Gas Associations Joint Committee

THE Junior Associations sincerely appreciate the opportunity of presenting this contribution to The Institution of Gas Engineers. It would not be possible, however, in the course of one Paper, which is representative of the ideas of the eight Junior Associations in the country, and which has been prepared by the Executive Committee of the British Junior Gas Association's Joint Council on behalf of the Affiliated Associations, to do more than give some general indication of the trend of their thoughts at the present time. Destructive criticism of current affairs is probably the more popular form of giving expression to the views of the Junior Associations, but the Authors have endeavoured to confine their remarks to bold and constructive suggestions whereby the enthusiasm of the members of these Associations can be harnessed and utilized for the benefit of the Gas Industry.

Historical.

The position and standing of the Junior Associations to-day are far different from what they were at the first small, but momentous meeting of twenty persons who, rather appropriately, held a meeting under a street gas lamp in Manchester nearly half a century ago. The new movement was not welcomed by certain sections of the Industry, but it continued to make good progress, and within ten years of the Manchester meeting, no less than five District Associations had been formed. In 1907 the first joint meeting of the English Junior Gas Association was held in Manchester on the occasion of the Gas Exhibition, and it was addressed by Dr. William Newbigging. A year later the first joint transactions were published.

The following table gives an indication of the present composition of the Associations:

Membership of the Junior Gas Associations.

		Technical.			Administrative.				
District.	Year formed.	Eng.	Chem.	Distr.	Exec.	Sales and Distr.	Total.	Non-Members I.G.E.	Corporate Members I.G.E.
1	2	3	4	5	6	7	8	9	10
London	1902	103	70	104	115	141	533	...	...
Yorkshire*	1903	...	...	...	...	...	145	...	...
Manchester	1898	180	80	50	6	16	332	268	64
Midland	1905	110	28	50	12	18	218	168	50
Wales	1922	22	4	19	6	46	97	83	14
Western	1926	44	14	27	16	9	110	74	36
Scottish (W.)	1904	74	8	...		71	153	127	26
Scottish (E.)	1904	40	23	5	24	25	117	94	23

* Records not available.

Retrospect.

The passage of years has tended to apply the adjectives of "Senior" and "Junior" to the members of the two types of Associations. There can be no harm in this so long as the ability of the men classed as "Juniors" is not judged by the same standards. The Authors believe that by receiving this opportunity of presenting a Paper to the Institution, the Junior Associations will at last be able to cast off their "Juniors" reputation, and will be recognized and accepted as an esential part of the framework of the Gas Industry.

In many spheres there seems to have been a lack of appreciation of the time and energy expended by the average Junior member, on a purely voluntary basis, to acquire a wider knowledge and to broaden his outlook of the Industry. This wider knowledge is attained chiefly by intimate contact with the practical features of the various sections of industrial activity, and by visits to numerous and varied types of manufacturing process plant and manufacturers' works.

The enthusiastic interest of members is shown by the high standard of the papers (both technical and non-technical in character) contributed since the inception of the Junior Association movement. These papers have proved the status of these Associations to be far above that generally understood by the word "Junior," and they form a distinct and valuable asset to the Industry. The Junior Associations consider that such contributions should continue to be a main feature of their activities.

Evidence of the spirit of enthusiasm and enterprise existing among the personnel of the Junior Associations is given primarily by the able manner in which they have co-ordinated their activities under a central Joint Council embodying all the Junior Associations in Great Britain. This has been recognized by affiliation to The Institution of Gas Engineers, and the formation of an Executive Committee to keep the Junior Associations abreast of the times and up to date with the various activities of the Industry. In reviewing the personnel of the Junior Associations it will be found that a substantial number of their members possess academic qualifications, practical knowledge, experience and responsibilities no less than (and in many cases in excess of) those carried by some senior executives, who by reason of their position have become entitled to membership of the Senior Associations. There is no intention by this statement to make any disparagements, but rather to state a generally acknowledged fact.

During the past few years the internal support of the Junior Associations has fallen short of the desired standard. This might, to some extent, be due to the high level of appreciation by the members of their responsibilities to the Undertakings they serve, to the difficulty of transport and to a desire to return to their locality with the minimum of delay. Nevertheless there are cases where more support and encouragement from senior officials would be appreciated by the junior. In fact, such support is necessary for the future well-being of the Gas Industry. This opinion is given with no small amount of consideration, as undoubtedly the junior is loyal to his chief and to the Industry. He looks for assistance and encouragement and strives to attain the high standard expected of him; as a result his interest ultimately becomes tempered by the measure of interest displayed by his superior officer or chief. With this in mind, therefore, it is considered that the change from junior to senior should not occur suddenly upon the attainment of a final qualification, but should be progressive throughout his whole career. This means that the Industry, the Undertakings and the senior executives must assume responsibility for the welfare and the development of their staffs. This is already in evidence in some Undertakings where considerable time and money are expended for the training of the juniors, but there are still some Undertakings where it is lacking. This point is one requiring no less attention and progressive foresight than that normally given to long-term policies concerning plant and administration.

Affiliation of the Junior Associations to The Institution of Gas Engineers is now effected, and whilst this has been the earnest wish of these Associations as a whole, they hope to travel further along the road of responsibility and look to the Industry to shape the course in due and reasonable time. By this means the spirit of responsibility would be fostered and developed, with a corresponding appreciation of the opportunities to render greater service.

This suggestion is made, not from any selfish and narrow point of view, nor with the expectation of encroaching upon the preserves of authoritative or administrative control, but of hope for a due appreciation of the higher standard of service which juniors can give to their seniors.

Post-War Planning.

The opinion is sometimes expressed that the views of the Junior Association should be appreciated within every section of the Gas Industry, and that full representation should be available to them, with the opportunity to discuss and submit recommendations on the numerous problems.

There are, however, many subjects exercising the thoughts of those responsible for the direction of the Industry which by their very nature are quite outside the province of the Junior Associations, and yet the temptation to give opinions is very strong. But there are many aspects of the future in which the Associations feel they are especially interested and, moreover, well qualified to express opinions, and it is hoped that where these circumstances arise the opportunity will be afforded.

Entrants into the Gas Industry

It is vital that greater care should be taken in attracting and selecting the right type of entrant into the Gas Indutsry. If the Industry is to continue to progress and to hold its own with the other great industries, this factor is surely a *sine qua non*. The social framework demands the opportunities for a reasonable standard of living if a supply of the right type of entrant is to be assured. Is the Gas Industry prepared to offer suitable inducement?

At the present time there is a tendency for entrants merely to drift into the Industry without any enthusiasm for its potentialities. It is a very old Industry, and one which on the surface does not offer the glamour which attracts entrants into other and newer industries. This attractiveness ought to exist in a fuel industry, which should and can supply to the post-war world a service second to none. It is felt that the Industry should be bolder in its claims, and think and act on a higher scale than in the past.

The study of the conservation of the nation's coal resources and of their transformation, at a high efficiency factor, into gaseous and smokeless solid fuels, motor spirit, explosives, tar products and their derivatives, fertilizers, &c., should be one which ought to attract the right type of man. The story of the Gas Industry and its vast potential

* Paper to the Institution of Gas Engineers.

of future service in providing light, heat and power to the public gives and offers a wide field of romance to youth.

It is very doubtful if those who have the responsibility of advising young men in the choice of a career realize the immense possibilities of the Gas Industry, which does not cater merely for one type of training, but offers scope for the physicist, the chemist, the civil and mechanical engineer, the administrator, the technical representative for service, and the like. It should therefore be one of the first concerns of the Industry to see that it obtains its fair quota of keen young men who are filled with enthusiasm for improving its efficiency and giving increased service.

Training and Education.

There has been felt for some considerable time by the junior personnel of the Gas Industry an absence of full training facilities for both technical and non-technical subjects, particularly in the latter case.

In the Institution's Education Scheme there are anomalies which it is hoped the proposed post-war Education Scheme will rectify.

The general feeling is a need for a more comprehensive plan whereby the junior can acquire a much wider knowledge outside his immediate locality; a knowledge of the business principles of the Industry, such as Commercial Law and Practice, Administrative Procedure, Economics, Sales Policy, and other matters allied to gas engineering and necessary to a well-planned Industry. This is fully recognized by some engineers and Undertakings, and many juniors who have been helped in this way record their appreciation. This outlook should apply in general, and there is a need to afford generous facilities for juniors both with regard to leave of absence and monetary assistance, so that they may be able to attend colleges for lectures and courses of training and instruction which have been so arranged as to make it possible for the more intelligent students to acquire a degree of proficiency up to University standard.

The provisions suggested are in no way to be classed as concessions; they are essential to the progressive functioning of the Industry.

Moreover, it is suggested that a panel of specialist lecturers be allocated to particular areas or regions to carry out a systematic sequence of regular courses of instruction at certain centres at which the attendance of juniors should be encouraged.

This suggestion may be considered revolutionary in character, but it is felt that a far-reaching scheme of this nature is no more than the Industry should provide for its juniors. Its attainment would not be beyond reach if sponsored under a co-operative effort by the Institution and the British Commercial Gas Association, or whichever body is ultimately formed for the post-war direction of the Industry. The Junior Associations feel that they should be closely linked up with any probable schemes dealing with entrance to the Industry and the education of students.

Literature.

There is a decided lack of suitable text-books for students and others studying for positions in the Gas Industry in all its aspects. This is to be regretted, and as it would appear to be the lack of a remunerative market which prevents publishing firms tackling the job, then it is for the Institution to take action. It is understood that this problem is being studied, and the Authors would emphasize the need for haste.

Public Relationship.

Perhaps a word may be included under this heading, not so much from the point of view of sales, but more from the personal angle. Engineers generally do not receive a good press, and perhaps the gas engineer suffers most of all in this respect. The service rendered by the Gas Industry has come to be regarded as commonplace by reason of its unfailing uniformity and reliability, and each and everyone must do all in his power to see that the importance of the Industry and the value of the work of those who serve it are brought to the public notice.

Status and Remuneration.

The consideration of salaries is *ultra vires* the constitution of most Associations. It is, nevertheless, a subject vital to members, and the question has arisen as to whether the objects of the Associations should be supplemented by reference to conditions of employment and remuneration. It has been suggeested that the Associations might concern themselves with conditions of entry and professional conduct, and might in general perform the functions of a professional association, or even trade union. Such a step would be revolutionary, and it is very questionable whether it would be advisable to proceed along this line at the present juncture.

For some time past the matter of salaries paid to junior personnel has been a cause of dissatisfaction, and there is no gainsaying the fact that it requires immediate and drastic consideration. There is no question about revision, as there never has been any distinct scale which provides a basic form of grading scheme for the personnel of the Gas Industry, but simply a merging for convenience with other industrial schemes of grading which has reacted unfavourably upon the status of personnel and their monetary reward.

The success of any scheme is largely measured by adequate service and adequate remuneration, and naturally the success of any training scheme will be achieved only if the right people are attracted to the Gas Industry by the knowledge that there are adequate salaries available therein.

Conclusions.

The foregoing are the opinions and viewpoints expressed by members throughout the Junior Associations, and the following is a summary of the suggestions made:

1. Greater personal interest, assistance and encouragement of the Junior Associations by seniors and by employing authorities are needed.
2. There should be official recognition of the Junior Associations and closer relationship between the Junior and Senior Associations.
3. Wider participation by the Junior Associations in the affairs of the Gas Industry is required.
4. Progressive development and elevation of the status of juniors is essential.
5. Comprehensive training and schemes for technical and commercial instruction are wanted.
6. Monetary and general facilities for educational purposes should be improved.
7. The provision of salary scales to ensure adequate remuneration is necessary.

Gas Lighting

The following is a report of the discussion on the Paper on the subject of Gas Lighting by Mr. D. M. Thompson to the Manchester and District Junior Gas Association, given on March 25, an extract of which appeared in the "Journal" of April 12.

The **President** (Mr. H. H. Thomas, Liverpool) referred to the fact that at the end of his Paper Mr. Thompson had made an appeal to the Gas Industry to take more interest in the activities of the Illuminating Engineering Society and not to allow it to become predominantly electrical. The Society was ready and willing to take into consideration the best aspects of any kind of illumination. There was a large number of domestic consumers of gas for lighting purposes, and whether that number would increase in the future would greatly depend upon the efficiency of lighting burners. Had Mr. Thompson studied the effect of gas quality upon lighting burners? The high temperature necessary for maintaining the mantle at its maximum degree of illumination was dependent on a highly aerated flame, which was again dependent on gas quality, apart from calorific value.

Mr. C. Worswick (Oldham) said Mr. Thompson had made a splendid case for street lighting by gas. In his, the speaker's opinion, the maintenance side of gas street lighting was most important, and the day was past when gas engineers could make lamp attendants from what might be termed "rejects" from other branches of the service. In the case of Oldham, the Gas Department has made every effort to assist the Lighting Department by supplying gas pre-war at 1s. 6d. per 1,000 cu.ft. for public lighting. Monochromatic lighting had not been adopted to any great extent in Oldham. When an attempt was made to correct the colour the overall efficiency was decreased. There was a better chance of correction in the case of the mercury lamp than with the sodium light.

Mr. H. C. Jackson (Stretford) said that the accusation that domestic gas lighting was a thing of the past was not without foundation. Adaptability, stressed by the Author, was not primarily responsible for the popularity of electric lighting. Their major obstacles in the domestic field were fashion, prestige, cleanliness, simplicity, and variety of control and design, convenience, portability, and lack of maintenance. The fact that 10,000 houses at Burnley were gas lighted was insignificant and bore no relation to future progress. They were all familiar with certain disadvantages of gas lighting in the home. He thought they must agree that this load could not be increased. If domestic gas lighting was a sound and competitive proposition, it was reasonable to assume that it would be accepted by many consumers in preference to electricity, but such was not the case. Dissatisfied lighting consumers were apt to condemn the undertaking and its general activities, with resultant loss of confidence and goodwill, so increasing the task of installing additional domestic appliances.

He wondered how many of the members present had gas lighting in their own homes, and if so for what particular reason He liked to sell a service which he knew would be appreciated in his own home, and this testimony was sufficient to ensure results satisfactory to the consumer and the undertaking. He favoured exterior shop-lighting, suburban street lighting, and flood-lighting by gas, but he fully agreed with the Author that improved designs were essential to ensure success. Industrial lighting had possibilities and distinct advantages in certain classes of premises and industries, and no doubt further developments would be achieved in this direction.

Mr. Thompson, replying to Mr. Jackson, said that he seemed to have given him the impression that he expected an increase in the domestic lighting load. He tried to make it clear that his opinion was that they should do their best to retain what they had. He was afraid the great majority of new houses would have electric lighting. Mr. Jackson had referred to the statement that 10,000 houses in

Burnley were gas lighted, and regarded this fact as insignificant. It was not insignificant to the Burnley Gas Department, nor to the people who continued to choose gas lighting and who were entitled to the best service. Their reputation for reliability had helped in obtaining traffic sign lighting, and it was a point in favour of gas street lighting. He could not understand why Mr. Jackson favoured suburban street lighting but did not mention main road lighting. If they could provide one, they could provide the other.

Mr. **J. Graham** (Lancaster) said that in his opinion the loss of the domestic lighting load was the root cause of the decrease in gas consumption per consumer. Unfortunately much of this business had been lost which could and should have been retained. Cheap and shoddy fittings mainly supplied by people outside the Industry, and the belated arrival of adequate maintenance systems, were the principal causes. In Lancaster the amount of gas sold for public lighting for the year ended March, 1939, was 62 millions, and it actually amounted to 13.6% of the total gas sold, the price being 2s. 3d. per 1,000 cu.ft. up to 30 millions, and over that 1s. 4d., the average cost being 1s. 9.3d. or 4½d. per therm.

Mr. **W. J. G. Davey** suggested that a more highly developed technique was necessary in the lighting load. Greater interest should be taken in the meetings of the Illuminating Engineering Society, of which, already, a number of gas engineers were members; more would be welcomed. A similar remark applied to the Association of Public Lighting Engineers. By not making themselves aware of the activities of such societies, gas engineers would be starting their lighting campaigns severely handicapped, if not blindfold. Their motto should be "Retention at all costs; extension where humanly possible."

Mr. **R. Walker** (Manchester) said the Industry itself was largely to blame for the present state of affairs; it had been swept off its feet by fashion. He was convinced that more scientific work should be undertaken to ascertain the technical possibilities of gas in regard to domestic lighting and all the fields of public lighting, particularly high pressure lighting, and street lighting, and they must have a more qualified technical staff.

Mr. **J. C. Hogg** (Stretford) thought the Gas Industry had not been sufficiently vigorous when dealing with the lighting problem in the past.

Mr. **A. L. Holton** (Manchester) said that probably very few gas engineers had gas lighting in their homes. Personally, he would not be without gas illumination in his own house on account of its reliability, and with modern fittings there was no blackening of the ceiling by the upward current.

When there was really good illumination by gas it was surprising how many people thought it was electric lighting.

Mr. **Thompson**, replying to the President, said that the Illuminating Engineering Societ- was not mainly concerned with street lighting; in fact it was probably less concerned with it than with other forms of lighting. Of course the Association of Public Lighting Engineers were specialists in regard to street lighting. If they could have a lighting fitting for which the maintenance and regulation were considerably reduced they could tolerate a small reduction in efficiency, particularly for indoor lighting. They had an advantage over electric lighting in the matter of depreciation of light output, since the decrease during the life of the source was small, whereas electric lamps were often left until they burnt out, by which time there was a big drop in light output and this depreciation was greater in the case of fluorescent lamps. In reply to Mr. Graham, it would certainly have been possible to retain more of the domestic lighting load if the problem had been tackled earlier; now it was a case of shutting the stable door after the horse had gone.

Mr. **James Sellars** (Manchester) said that already in America small fluorescent lamps of a circular pattern had been evolved and would certainly be available in this country soon after the war. Three sizes were projected—20, 30, and 40 watt, the bulbs having respective overall diameters of 8½ in., 12½ in., and 16 in.

Mr. **Thompson** remarked that the 40-watt lamp mentioned had the large diameter of 16 in., and when a suitable housing was taken into consideration a very large unit would be required.

Mr. **J. K. Lord** (United Kingdom Gas Corporation), in a written communication, said there were four distinct types of competition in the public lighting field, which might be enumerated as follows:

1.	Gas—Municipally owned	.	Electricity—	Company owned.
2.	,, ,, ,,	.	,,	Municipally owned.
3.	,, Company ,,	.	,,	Company owned.
4.	,, ,, ,,	.	,,	Municipally owned.

He suggested that in that order did the difficulty of obtaining and retaining the public lighting load increase. He agreed with the Author's remarks regarding centralization of lighting in one department and that the larger undertakings should have a competent technical man in charge, and he suggested that such undertakings could render great assistance by loaning his services, especially at the time when the smaller undertaking was faced with the task of planning a scheme and tendering for public lighting within its area of supply.

Mr. **Thompson** remarked that it was quite true that company-owned undertakings found it harder to retain the street lighting load, and in these cases the appointment of an independent public lighting engineer should be of benefit.

COMPANY MEETINGS.

South-Eastern Gas Corporation

Future Control of the Industry

The Twelfth Ordinary General Meeting of South-Eastern Gas Corporation, Ltd., was held on June 15 at 1, Grosvenor Place, London, S.W.

Sir DAVID MILNE-WATSON, Bt., LL.D., D.L., the Chairman, presided.

The following statement by the Chairman was circulated with the report and accounts:

A short review of the results for the year ended March 31, 1944, is given for the information of stockholders. As before, this must be limited to the figures shown in the accounts of the Corporation, since no details can be given of the results of the gas supply undertakings which the Corporation controls.

The balance-sheet shows that the total amount invested in subsidiary companies has increased by nearly £6,000, as a result of the Corporation purchasing additional stocks and shares which were offered for sale during the year.

Cash Position

I mentioned in my statement last year that, on account of the restricted supply of materials and labour, it is not always possible at the present time for our subsidiary companies to carry out their normal programmes of repair and maintenance. Where possible reserves are being created to meet the cost of work which has had to be deferred, and this, together with the reduction in the amount outstanding on hire purchase, has increased the cash balances of some of the subsidiary companies.

This is reflected in two items in the balance-sheet of the Corporation. The amount on loan to subsidiary companies at March 31, 1944, was £144,000, a decrease of £26,000 during the year, while the amount deposited with the Corporation by subsidiary companies has increased by over £180,000 to £659,000. This temporary increase of cash in hand has enabled the Corporation to invest £250,000 in Government securities by the purchase of 2½% National War Bonds.

Dividend Maintained

The revenue account shows that £4,000 was received during the year as interest on these bonds, while the other items for loan and deposit interest have altered in consequence of the changes referred to above. There has been very little change in other receipts and expenses and the balance on revenue account for the year is £193,304, which is within £100 of the balance for the previous year. After paying the usual Preference dividends and an interim Ordinary dividend, and taking into account the balance of profit brought forward, there is a sum of £141,520 available for distribution. The Directors recommend that a final dividend of 2½%, less tax, be declared, which will make an Ordinary dividend of 4%, less tax, for the year, and leave £78,302 to be carried forward.

Increased Cost and Prices

During the past year the Gas Industry has had to meet further substantial increases in the price of coal, and in the wages of gasworkers, in addition to the continued all-round rise in the cost of practically all other items in the manufacture and distribution of gas. This has made it necessary for some of our companies to increase the price of gas. Such increases can, of course, only be made with the consent of the Ministry of Fuel and Power, and in all cases they have been kept to the lowest possible figure having regard to the financial circumstances of the particular company.

Post-War Planning

In my statement last year, I mentioned that various committees of the Gas Industry had been very actively considering post-war development. A comprehensive report was submitted to the Minister of Fuel in October last which deals with the history and development of the Gas Industry up to the present time, and goes on to consider the future position of fuel in the industrial and economic life of the country. The report stresses the need for coal conservation, and recommends the establishment of a National Fuel Advisory Council to regulate competition between the fuel industries in the national interest.

Dealing with the future of the Gas Industry in particular, the report points out that, whatever the form of control and organization may be, the practical problems will remain the same, and that replanning should be flexible and based upon co-operation between company and municipal enterprise. Substantial reasons are given for the claim that no case has been made out for nationalization of the Industry, but a considerable degree of integration of undertakings is recommended, in order to obtain the greater efficiency of larger units working over wider areas.

It is suggested that this integration should be brought about either by direct amalgamation of undertakings, by the association of undertakings under the control of a gas corporation, or by joint working arrangements. It is further recommended that Parliament should

appoint a Standing Integration Tribunal, which would deal with any difficulty that might arise in carrying out integration proposals.

No Case for Nationalization

There has been a great deal of political talk about the necessity for nationalizing the basic industries and so-called "monopoly" industries of the country in order to ensure cheap and abundant supplies of the commodities of these industries. Assuming it is the intention that the Government should purchase the gas undertakings from their present company and municipal owners at a fair valuation, the only economies and improvements which could be brought about by nationalization of the Gas Industry are those which would result from integration, such as the concentration of manufacture at the larger and more efficient works, the proper planning of distribution over wider areas, and more uniform methods of charge.

It is difficult to see how any Government-controlled board could carry this out as well as the present owners of the Industry, who combine a wealth of knowledge and experience in the administration of gas undertakings with the enterprise and initiative which has always been fundamental in private ownership.

The Gas Industry may have had a monopoly at one time, when gas was principally used for lighting, but this ceased many years ago when electricity also became available. Since that time the use of gas for cooking and heating of all kinds has developed so much that the main business of the Gas Industry is now the provision of heat, in keen competition with electricity, oil, and solid fuel. The interests of the gas consumer are protected both by competition and by a comprehensive system of legislative control, which has been developed under the supervision of Parliament for more than a hundred years.

Private enterprise in the Gas Industry is already subject to public control, and, indeed, it is generally thought that some of the restrictive legislation which has survived from the past requires revision if the Gas Industry is to play its full part in meeting the future demands for gas as the most convenient and economical form of heat service.

The Directorate

The appointment of Mr. R. W. Foot to be Director-General of the B.B.C. in September last made it necessary for him to resign his position as a Director of the Corporation, which he had held since 1933. It was with great regret that the Directors accepted his resignation. Mr. A. E. Sylvester, a Managing Director of the Gas Light and Coke Company, has been appointed a Director of the Corporation in place of Mr. Foot, and his knowledge and experience will be of great value to us.

The day-to-day operation of gas undertakings is becoming more and more difficult owing to shortage of labour and other adverse conditions, which are to be expected at this stage of the war. Our thanks are again due to the officers and employees of associated companies and of the Corporation for the splendid way in which they have carried out their duties. We greatly miss those of our employees, over 1,200 in number, who are serving in the armed Forces, and hope for their safe and speedy return.

The report and accounts were adopted, and the dividend approved.

United Kingdom Gas Corporation

Success of Group Working

The Ninth Ordinary General Meeting of the United Kingdom Gas Corporation, Ltd., was held on June 13, at Shell House, Bishopsgate, London, E.C.

Mr. BRUCE OTTLEY (Chairman of the Corporation) presided.

The representative of the Secretaries, Close Bros., Ltd., having read the notice convening the meeting and the report of the auditors, the CHAIRMAN said: Another year of war has passed since I last had the pleasure of addressing you, and once again I am precluded from giving you more than a cursory view of the Corporation's activities and present condition.

The net revenue for the year amounts to £119,000, as against £115,000 in the previous year. It should be borne in mind that no effort has been made to extend the sale of gas, but, on the contrary, every effort has been made to encourage economy in its use in every direction.

There has been expended £136,206 in service to our subsidiary companies; of this amount, £96,877 represents the cost of wages and materials for work carried out in the maintenance of works by our constructional and repair squads.

The standard of efficiency has been well maintained, notwithstanding the circumstance that we have been called upon to operate continuously at high cost carburetted water gas plants originally provided as standby for the meeting of peak loads.

An outstanding feature of your Corporation's activities during the last year has been the extension of group working, whereby subsidiary undertakings conveniently situated geographically, and of such size as to be convenient for unified operation and administration, are placed under one combined management. The Corporation's first group, formed some six years ago, was the Castleford group of companies, comprising eight subsidiaries under centralized management. Uniformity has been evolved throughout, with excellent results and greatly reduced price of gas.

Reduction in Gas Price

As an indication of the results achieved by this group, I would point out that it has been possible by reductions to standardize the price of gas throughout the area, the net result being that the average price received for all gas sold as a result of the economy of centralized control and administration is 25% below the average price received at the time the group was formed. All units of the group have derived benefit not only in reduction of administrative and operational costs, but in the greatly improved service to the consumer made possible by specialized staff backed up and reinforced by that of your Corporation, which could not be made available in an independent unit.

It should be noted that while there is a limit to the size of a group which can be economically and efficiently operated under one management, it was decided, after careful survey and investigation, to extend the Castleford group of companies, to include a further seven companies, the whole now being known as the West Riding Group of Gas Companies, with headquarters based on the principal unit, the Wakefield Gaslight Company.

Group working has also been established as between the York, Harrogate, Malton, and Easingwold undertakings, and other schemes are under survey.

The West Yorkshire Gas Distribution Company, which is now linked up to municipal undertakings as well as to companies controlled by your Corporation, continues to expand, and has amply proved the soundness of its original conception.

It is important that planning of gas supplies both as regards production and distribution should proceed in line with the planning of the great housing schemes, so that the essential gas fuel service may be available as the new houses are erected, also to meet extended industrial requirements that are likely in many areas to follow upon the changeover to peacetime production.

We welcome, therefore, the announcement by the Minister of Fuel and Power of the setting up of a Committee to Enquire into the Gas Industry, and we hope that their deliberations will result in the Industry as a whole being permitted to proceed with the development of the plans for integration and co-ordination of gas supply, and that we may be enabled to continue our successful development work in those areas in which we are interested.

Services Improved

In spite of the difficulties of wartime, and the restrictions imposed upon us, we have been able to improve our services to the public, and they will be further improved and cheapened as and when we are permitted to continue our development.

It is beyond question that a public utility should be developed to give the cheapest and most efficient service that is possible. We have, in a comparatively short space of time, been able to build up a business edifice, the results of which indicate its tremendous potentialities for the speedy co-ordination of the Industry.

Appreciating, as we do, that our primary responsibility is the service we are able to render to the consumer, we would welcome Government supervision, and believe this supervision can best be operated by a measure of statutory control being applied to your Corporation as well as to its subsidiaries. It will then be for our Corporation to satisfy the Government that any development which it may propose is in the best interests of the public it is designed to serve.

I cannot close without reference to the excellent work of the staffs of the Corporation at our headquarters and of the companies. During the year Mr. Hodkinson, who has been the Principal Assistant to our Managing Director, Colonel Carr, has been appointed General Manager.

The resolution was carried unanimously, the dividends as proposed were approved, the retiring Directors were re-elected, the Auditors were reappointed, and the proceedings then terminated.

The Factory of Messrs. Thomas Potterton (Heating Engineers), Ltd., will be closed from June 23 till July 2, during which period no goods can be despatched. Correspondence will be dealt with as usual.

The Engineering Production Annual has been published by Paul Elek (Publishers), Ltd., in a series of Development Reference Annuals. The aim is to give a concise review of developments during the preceding year gleamed from articles and lectures, and so on. Each chapter gives a list of references. The *Engineering Production Annual* covers machine tools, drawing and pressing, surface protection and hardening, hard facing, soldering and brazing, powder metallurgy, cutting tools, oils, and compounds, welding, bearing methods, inspection methods, and quality control. The price is 8s. 6d.; postage 6d., abroad 1s.

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Gas and Electricity in Homes of To-morrow*

By R. E. GINNA,

Rochester (N.Y.) Gas and Electric Corporation

THIS report, entitled "Gas and Electricity in the Homes of To-morrow," is part of the sub-committee's report on factors affecting the realization of potential markets, and of necessity it has been limited by available time and lack of sufficient individual company research in the economics of gas supply. We have done what we could, and offer herein certain material which we hope will produce constructive post-war thinking, and encourage the Gas Industry to explore further its weaknesses and strength to meet electricity, its chief competitor in the homes of to-morrow.

At the outset we urge the Gas Industry to be a fair competitor; that it should avoid starting any unfair new business practices; and where combination service is supplied, that such companies show an example of *why* there is room for both services in the homes of to-morrow, and prove that domestic gas and electricity are complementary to each other, and that both have their advantages to the customer.

In preparing this report it was difficult to decide what particular phases of a rather comprehensive subject would be most useful to the Gas Industry in its post-war planning. We were anxious to accomplish two things: first, to show a few facts of national significance, a specific illustration of gas and electric service in a settlement of moderate priced homes built just "before Pearl Harbour,' 'and the relative incremental distribution investment for domestic gas and electric loads; second, from this information to draw certain conclusions that might be worthy of attention by the industry in its post-war plans.

Before commenting on and summarizing our observations, it should be pointed out that in the last analysis each company must be responsible for its own salvation. It can't ride to glory on any wings except its own, and if it wants to be saved, it had better begin now to study seriously and prepare for salvation.

The following summary has been considerably condensed, and it is hoped that chief executives of the Gas Industry will pay particular attention to the thoughts expressed. It is obviously not possible to dwell at length on the significant features of each section of this report and, therefore, only generalizations are offered in this summary.

1. In December, 1942, in the United States the electric industry had more than 50% more domestic customers than gas had. The difference was nearly 10 million meters. Of course it is recognized that the electric industry reaches out into suburban and rural areas where the Gas Industry cannot economically serve; nevertheless, this difference in number of existing customers is a factor that will play an important part in reaching the potential markets of to-morrow. Think of the effect of electricity having the advantage of 10 million more customer contacts and readers of promotional publicity! This fact alone should impel every gas company in the country to support and encourage the national advertising programme of the Gas Industry.

2. The war needs of the nation have accelerated the installation of electric generating capacity throughout the country. In many geographic areas the increase during the past five years has been quite substantial, and in certain areas the gain has been largely in "publicly owned" plants. All this wartime capacity will be a factor in the struggle for domestic appliance post-war markets. One deterrent in the promotion of electric cooking has been the unfavourable load characteristics of the electric range.

Following the Rochester domestic gas and electric economic studies in 1936, the electric range situation became of concern to certain large electric companies. The result was the formation by the Association of Edison Illuminating Companies of a Special Committee on Load Studies.

This committee began the collection, correlation, and interpretation of a mass of data covering the load characteristics of thousands of residential electric customers. The work was carried on by a standing group of men over a period of five years. The conclusions of this committee had far-reaching effects upon the sales policies of many electric companies. In particular, it was recommended that electric ranges by themselves had undesirable load characteristics, and that simultaneous introduction of water heaters was necessary. With the coming of peace and the cancellation of war production contracts, with the resultant drop in industrial load, surplus plant capacities may force many electric companies to seek the electric range load either with or without the water heating one.

When the Gas Industry is willing to work as hard and with as much unanimity and purpose as the electric industry, it may find the way to better times, provided like studies are made and acted upon.

3. As indicated, the electric industry has obtained the major share of potential customers, and in spite of the possible dilution effects of customer growth upon average use, the national kwh. per domestic customer has gone up better than 60% since 1934.

Compared with this, domestic manufactured gas service, even including a considerable increase in space heating, is barely holding its own. Natural gas, although showing marked variations between 1934 and 1942, managed to advance only 14% in domestic use per customer during that period.

* Part of Paper to American Gas Association.

Complacency Unwarranted

There is no use minimizing the serious nature of the Gas Industry situation. The question is whether the gas business will emulate the policy of some of our former enemies who choose not to struggle, or whether Bataan, Guadalcanal, and Salreno will be its inspiration to go forward.

4. Considering the relative cost to the consumer of the use of gas and electricity for cooking, refrigeration, and water-heating, perhaps no other information could better show how unwarranted has been the complacency of the Gas Industry. The figures show that the customer cost differential in favour of gas over electricity for cooking is about a dollar per month. Too long has this price spread been generally accepted as some kind of safeguard against the inroads of electric cooking, and too little has it been realized how small it has become.

As one views the American tendency to obtain what it wants (and this characteristic may be stronger after the war), no longer can the Gas Industry rely on rate advantage to hold its cooking business. It must be able and ready to replace obsolete cooking equipment with gas ranges of equal or greater customer appeal than will be offered by the electric industry, and build this acceptance of gas in conjunction with the "Unified Gas Wonder Kitchen of To-morrow."

Not even an operating cost differential in favour of gas exists in most places for the gas refrigerator. Obviously there is needed a selling job to convince the American people that gas has many advantages as a refrigerating agent, and the Industry will have to prove that the gas refrigerator of to-morrow will have features that best satisfy the customer's wants and desires.

Electric water heating even at off-peak electric rates is no immediate threat where gas is available. But of course it must not be forgotten that in order to have gas available it is necessary that the Gas Industry obtains its share of the basic cooking and refrigeration business. The one great truth about the domestic gas water heating business is that the Gas Industry has failed to make people understand that modern gas water heaters afford quick action and absolutely continuous economical service. A large share of the national advertising campaign should be devoted to the ease, comfort, and satisfaction of automatic hot water with gas, and if necessary stress that proper hot water service is as essential in the Home of To-morrow as refrigerating our food.

5. Theoretical studies have their place, but they require, most of the time, actual results to prove their premises. In this report there is a study of gas and electricity in a modern subdivision. The homes are somewhat of the type expected in the post-war building boom. It is a real picture of the present utilization of these services. Preceding the actual data there are certain observations, not the least of which are: (*a*) that all of the domestic gas service including water heating and house heating could be supplied with only a minor increase over that amount of distribution investment which is already in place, and that the company's revenue would be more than doubled if that took place; (*b*) that electricity shows to good advantage in the subdivision even where gas rates were attractive and the promotion of gas appliances active; (*c*) that the question of a sound post-war gas main extension policy for new developments, either in the case of a combination company or a straight gas company, seems to depend largely on whether or not the particular utility can economically provide sufficient quantities of gas for house heating, or if not, that it makes certain that each new post-war home is equipped initially (at time of construction) with at least gas cooking and automatic water heating, with furnace coils prohibited by rate restrictions.

We must urge that each utility must make its own study to find out what is best for its own interests. Distribution construction problems are different in various parts of the country and between metropolitan and suburban territories, and in the last analysis the medicine that will do the most good must be prescribed individually. That there is lack of such self-analysis became clear to this sub-committee when but few responses were obtained from a nation-wide enquiry to obtain case-histories.

Findings of Sub-Committee

The sub-committee's conclusion is that studies, reports, speeches, &c., are undoubtedly valuable, but there are known things to be done. Briefly they are as follows:

1. Develop appliances and methods of installation and use.
2. Develop economic and reliable apparatus and methods for production and distribution.
3. Study markets and costs of service.
4. Nationally advertise gas.
5. Prepare to sell.

Some of these—namely, Nos. 1, 2 and 4—can and must be done on a national basis. In this, the various committees and staff of the American Gas Association can render great assistance, and have already done so as evidenced by the reports made at this Association meeting. The other two items, Nos. 3 and 5, are of individual company concern and responsibility.

Again I repeat, gas and electric services are complementary to one another in the Home of To-morrow; each has its legitimate field; both have more in common than they have separating them; and it is more wholesome for service industries, whether governmental or privately financed, to present a united front in serving the public than to be at one another's throats.